

Jan. Dec. Complete
VOLUME VIII. No. 4.

WHOLE NUMBER, 32

PROGRESSIVE MEDICINE

A QUARTERLY DIGEST
OF
ADVANCES, DISCOVERIES AND IMPROVEMENTS
IN THE MEDICAL AND SURGICAL SCIENCES

EDITED BY

HOBART AMORY HARE, M.D.

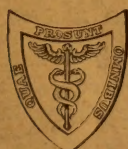
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DECEMBER 1, 1906



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PUBLISHED QUARTERLY

BY

LEA BROTHERS & CO.

708 SANSON STREET

PHILADELPHIA

Subscription price, \$6.00 per annum

Awarded Grand Prize, Paris Exposition, 1900.

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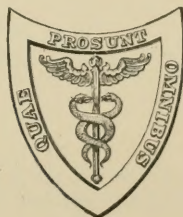
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VOLUME IV. DECEMBER, 1906.

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS: LIVER, PANCREAS, AND PERITONEUM—ANÆSTHETICS, FRACTURES, DISLOCATIONS, AMPUTATIONS, SURGERY OF THE EXTREMITIES, AND ORTHOPEDICS—GENITO-URINARY DISEASES—DISEASES OF THE KIDNEYS—PRACTICAL THERAPEUTIC REFERENDUM.



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PROGRESSIVE MEDICINE.

DECEMBER, 1906.

DISEASES OF THE DIGESTIVE TRACT AND ALLIED ORGANS, THE LIVER, PANCREAS, AND PERITONEUM.

By J. DUTTON STEELE, M.D.

THE MOUTH AND ESOPHAGUS.

Ulceromembranous Angina. (*So-called Vincent-Plaut Angina.*) There has been a revival of interest in this disease during the last few years. Its recognition as a distinct pathological and clinical entity is by no means new for the affection was described clinically by various French and Russian observers even before Vincent, with whose name it is usually associated. Its bacteriology was investigated in 1893-4 by Rauchfuss and Plaut.

The disease is known under various names, of which the most important are ulceromembranous angina and stomatitis, Vincent-Plaut angina, pseudomembranous, or diphtheroid angina, and stomatitis ulcerosa. It is probably of frequent occurrence, indeed, much more common than has been generally supposed. This, combined with the fact that it is of considerable importance, clinically warrants the somewhat extended review of the subject that follows:

Several articles of value have appeared upon the subject during the past few years. The most important of these are the following: Beitzke,¹ Weaver and Tunnickliff,² Berkeley,³ Eichmeyer,⁴ Harwood-Yarred and Pantan,⁵ Reiche,⁶ and Morian.⁷

¹ Centrbl. f. Bakteriologie, Referate, 1904, xxv, p. 1.

² Jour. of Infect. Dis., 1905, vol. ii, p. 446; Jour. Amer. Med. Assoc., February 17, 1906.

³ Med. News, May 27, 1905, lxxxvi, p. 976.

⁴ Jahrbuch f. Kinderheilkunde, 1905, lxii, p. 65.

⁵ Lancet, February 17, 1906.

⁶ Münch. med. Woch., 1905, No. 33.

⁷ Ibid.

Ulceromembranous angina is a disease of the mucous membrane of the mouth, tonsils, and pharynx characterized by the formation of a false membrane generally with ulceration, though occasionally without. Two varieties of bacteria are found in the false membrane: namely, a fusiform bacillus and a spirillum. These can be easily demonstrated in smears by the ordinary stains but have never been satisfactorily cultivated. Indeed, it is probable that the reason why the disease has been so frequently overlooked is because the taking of smears for the detection of diphtheria bacilli is unsatisfying and cultures are invariably resorted to in the diagnosis of that condition.

However, diphtheria is the condition that would naturally suggest itself to the mind of one unacquainted with ulceromembranous angina, and as the former condition, as I have said, is always looked for by culture and as the bacteria of the latter cannot be cultivated, it is easy to see why so many cases of ulceromembranous angina have not been recognized.

Weaver and Tunnickliff give the following concise description of the bacteriology and clinical features of the disease:

The bacilli are long, slender rods with pointed ends, somewhat larger in the middle. Sometimes the ends are rounded and the rod may be rather thick. They are sometimes slightly bent, and occasionally take the form of the letter S. The length is usually from six to twelve microns, but sometimes filiform elements of considerable length are encountered. The bacilli are usually scattered uniformly throughout the preparations and often occur in pairs end to end, sometimes forming more or less obtuse angles.

At times they are seen in irregular clumps, or arranged radially about a common central point, or in rows somewhat similar to diphtheria bacilli. They stain fairly well with Loeffler's solution of methylene blue and aniline-water solution of gentian violet, but best with carbol-fuchsin. With the less intense stains, especially in the larger forms, there are often portions of variable size and shape which stain faintly. No motility could be detected.

The bacilli do not stain by Gram's method. The number of bacilli is variable. In the earlier stages of ulceromembranous angina and stomatitis they are most abundant, and they decrease as the process of recovery advances. A few bacteria of other varieties are usually found in the lesions, and as the specific organisms decrease the associated bacteria usually increase. In normal mouths the fusiform bacilli were present in small numbers in smears from the saliva, tongue, and gums.

The spirilla, also spoken of as spirocheta, which are associated with the fusiform bacilli in a large portion of instances, are long and delicate, and present three or four turns. They stain uniformly and much less

intensely than the bacilli, and in faintly stained preparations might be overlooked. They do not stain by Gram's method, being much more quickly decolorized than the bacilli. They are usually quite actively motile, but sometimes not. The association of spirilla with the bacilli was observed in all the cases studied. In general they were in numbers corresponding to the number of bacilli. In the mouths of many healthy persons what appeared as the same spirilla were found, especially about the gums, often in enormous numbers.

The primary location of the disease is usually on the tonsil and edge of the gums. It may extend from these locations to the tongue, lips, even the soft palate, pharyngeal wall and cheek. Extension beyond the common primary locations is not the rule. The deposits on the tonsils are usually irregularly oval or circular. The disease may be bilateral, but is usually unilateral. The pseudomembrane may be grayish, whitish, yellow, yellowish brown, or greenish in color. It is sometimes described as resembling the pseudomembrane of diphtheria, but usually it is thick, cheesy, and friable in character. It may be marked by small hemorrhages (Hecht). The false membrane is usually readily removed, leaving a superficially abraded surface which bleeds easily and becomes again covered by an exudate in a few hours. With the progress of the disease, the ulcer may become much deeper, but shows little tendency to extend laterally. Sometimes the destructive process extends more deeply, leading to the destruction of the tonsils, uvula, and parts of the pharyngeal wall (Barron, Bruce, and others). As a rule only one ulcer is present but sometimes several are observed. The ulcers may become confluent. Sometimes the ulceration is very superficial or absent. The anginas have been classified by Vincent and others as croupous or membranous and as ulcerative, according to whether the ulcerative process is slight or prominent. The surrounding mucous membrane is red and is slightly or considerably swollen. If the lesion is not observed at the outset, there appears to be no inflammation.

The submaxillary and retromaxillary glands are usually swollen, corresponding to the location of the disease in the mouth or throat. The swollen glands are firm, a number of small ones usually forming the mass, and they rarely suppurate. There is, as a rule, no periadenitis. Raoult and Thiry claim that the glands are rarely swollen except in badly cared for cases, and use this fact as an aid in diagnosis.

Healing takes place slowly after three to forty-five days. The swollen glands often remain enlarged for some time.

ETIOLOGY. *Age.* The disease is one of childhood and early adult life.

Sex. Males are said to be more often affected than females, according to most observers. This is probably due to the fact that many of the patients have been soldiers and medical students.

Predisposing Causes. The use of tobacco; trauma of the mucous membrane, as after tonsillotomy; eruption of a wisdom tooth; defective teeth or those covered with tartar; alveolar abscesses; gums of scorbutics; syphilis and mercurial stomatitis are said to predispose to this disease. It is said to follow the acute infectious diseases. Two of the cases studied followed scarlet fever, one followed measles, and one whooping-cough. Twice the condition was present at the onset of scarlet fever. The teeth were covered with tartar in the majority of the cases reported by Weaver and Tunncliff. Chronic enlargement of the tonsils and adenoids was present in their experience. A previous history of alveolar abscess was obtained from one patient.

Symptoms. The symptoms vary much with the severity of the disease. Often there are no symptoms or only slight ones, and the lesion is found accidentally. The following symptoms may occur at the onset: A feeling of dryness or discomfort in the throat, dysphagia, lassitude, headache, coated tongue, epistaxis, chills, and fever. As a rule, there is little or no fever.

One to five days after the onset the local condition is observed. Then the chief symptoms are pain in swallowing, salivation, and fetid breath. These symptoms do not always occur. Sometimes the dysphagia is slight. The breath may not be fetid if the case is mild or if antiseptic solutions have been used.

If the gums are affected the teeth may become loose. There may be bleeding from the gums even if they are free from membrane.

Athanasia speaks of earache and nasal discharge as occurring at this period. Oberwinter also often noticed a nasal discharge and urges the importance of this symptom in young children as directing attention to the throat. A nasal discharge has been observed only once (Weaver and Tunncliff). In this case the organisms were found in the nose before they appeared in the mouth.

Contagion in connection with this disease has been observed by Vincent, Dopter, Bernard and Auger, and others, but for its occurrence close contact is apparently required. Costa says that it may be communicated by means of pipes, pencils, etc. Small epidemics have been observed, especially in families. Seven cases occurred in the Memorial Institute within four months, but there was no proof that it was transmitted from one patient to another (Weaver and Tunncliff).

Diagnosis. The diagnosis is made by the finding of the characteristic fusiform bacilli in the smears prepared from the exudate, usually in association with the long more faintly staining spirilla. The organisms are not stained by Gram's method. It is always necessary to exclude diphtheria by means of proper cultures, as the diphtheria bacilli may be associated with the fusiform bacilli. Syphilitic lesions must also be excluded by the history and associated signs of the disease.

Prognosis. The prognosis is usually good, but it must not be forgotten that considerable destruction of the tissue may occur in rare cases, and that gangrenous processes and noma of the face may develop from these ulceromembranous lesions. Barron, Bruce, and others have noticed a tendency for the disease to recur after partial or apparently complete recovery.

Treatment. Filatov and Nevegin consider *chlorate of potassium* administered internally a specific for the disease. Crandall also found that chlorate of potassium did most good. Barron believes therapeutic applications of little use. Various antiseptic solutions have been used locally and tincture of iodine is spoken of with favor. Because of the anaerobic character of the bacilli, peroxide of hydrogen is most useful and should be applied directly to the seat of disease. Sobel and Herrman made use of a 3 to 5 per cent. solution of silver nitrate, applying it daily to the diseased areas. At the Memorial Institute success attended the use of peroxide of hydrogen by the following solution (Weaver and Tunnickliff):

R.—Phenolis	f 3 ss	2.
Zinci sulphocarbolicis	3 ij	8.
Aquæ	q. s. ad f 3 vi	180.

X-ray Treatment of Esophageal Cancer. The operative treatment of esophageal carcinoma is at present either one of the impossibilities of surgery, or is attended by great difficulties and very little hope of recovery. A new factor in the treatment of cancer has been introduced by the discovery of α -ray therapy and of radioactivity. But in the application of these agents to deep-seated growths, the difficulty lies in obtaining an amount of energy sufficient for curative purposes, without injuring the healthy tissues through which it must pass. W. Wendel¹ believes that he has solved this problem in relation to esophageal cancer, by conducting the Röntgen rays to the seat of the growth through the esophagoscope. He reports the result in a case where there was an almost complete obstruction of the esophagus 35 cm. from the teeth. By anesthetizing the throat with a 10 per cent. solution of novokain, the largest-sized esophagoscope tube could be introduced, which thus permitted the passage of the α -rays through the longitudinal axis of the tube directly to the seat of disease. After eight sittings the patient was lost sight of but during that period a marked improvement had been noted. Ulceration had entirely disappeared; the patient could swallow food after thorough mastication, and he had begun to gain in weight. It was also noticed that the esophagoscope could be introduced 3 cm. farther than at the first sitting. This one case is suggestive of further development along these lines, with possible application to other situations, such as rectal carcinoma.

¹ Münch. med. Woch., 1905, No. 51, p. 2490.

THE STOMACH AND INTESTINES.

Occult Bleeding as a Sign of Gastrointestinal Disease. There is no doubt that the detection of minute hemorrhages from the gastrointestinal tract by chemical means has become a symptom of acknowledged importance in the detection of gastrointestinal disease. During the three years that have passed since Boas called attention to the fact that we were missing a valuable means of diagnosis by neglecting Weber's test for blood in the stools, the subject has been considered in many papers and many series of observations have been recorded, all of which have been considered in *PROGRESSIVE MEDICINE*, December, 1904 and 1905.

The best authorities have expressed their reliance in the test and have emphasized its importance. F. W. White, of Boston, voiced the opinion that was frequently expressed at the recent meeting of the American Medical Association that the detection of occult bleeding is, in spite of exceptions, the most valuable single clinical symptom recently developed for the detection of latent cancer or ulcer. And now there is danger of accepting occult blood as a sign of cancer or ulcer too promptly without recognizing the difficulty of correctly interpreting the source of the bleeding.

I can heartily support Ewald's statement when he says that instead of making gastrointestinal diagnosis easier by making the search for occult bleeding a matter of clinical routine, we have really made it harder. This means that we have added a symptom to our armamentarium which is very useful when correctly interpreted but can be very misleading if care is not taken to give it its true value. Still, if we can exclude bleeding from the mouth and rectum, then the presence of occult blood in the stools is always a danger signal and we should not rest until we have used every means in our power to discover its source.

OCCULT BLOOD IN THE DIAGNOSIS OF GASTRIC ULCER. By the use of the Weber test and its various modifications, we have changed the significance of blood in the stool from a sign that gastric ulceration has reached a stage of danger, into a means of diagnosis that is available in the quiescent stages of ulcer. By its help we can detect latent ulcer, can predict the occurrence of relapse in cases in which the ulcer is apparently healed, and can watch the effect of diet and remedies.

In the diagnosis of ulcer we must remember that a quiescent peptic ulcer does not bleed as much as we might expect it to do, and unless we make routine and frequent examinations we will not detect occult blood. Conversely in doubtful cases we cannot exclude ulcer unless we watch the stools for at least a week, and if the question is as to the presence of chronic indurated ulcer, for a month. But when we have the evidence what such patient search will give, it is correspondingly valuable.

PERSISTENCE OF BLEEDING DURING AN ULCER CURE. A point in regard to occult bleeding concerning which we needed more definite information is the significance of continued bleeding after the patient has been upon a milk diet for some days or weeks. The persistence of bleeding under these circumstances would seem to be, and probably is, a bad prognostic sign. Boas says that in his experience it means the development of a cancer in the floor of an ulcer. Billings said in the Boston discussion that he always considered persistence of bleeding beyond a reasonable time a sign that the ulcer was chronic and surgical intervention was indicated.

Personally, I have not seen enough of such cases to express an opinion. The following case, however, would seem to indicate that recurrent hemorrhage upon a milk diet does not always mean that cancer is developing or that the ulcer will not yield to medical treatment.

Female, white, aged forty years. The patient had had four attacks of vomiting and blood in the stools during the last four months; anemia was extreme; epigastric pain and tenderness were present. During the first period, lasting eight days, with rectal feeding, three positive tests for occult blood were made. In the second period, lasting fifteen days, raw eggs and milk were given by mouth; five positive tests were made, the last on the last day of the period, namely, twenty-three days after the cure was commenced. There was great improvement in the blood and nutrition, and finally complete recovery. There has been no recurrence in eighteen months. Here was a case in which bleeding persisted for twenty-three days and yet medical treatment effected a cure.

Ewald¹ says in this connection that it seems probable *à priori* that a malignant process which does not tend of itself to healing (cancer) would cause persistence of symptoms in a benign process that has of itself naturally a tendency to heal (peptic cancer). However, he quotes a case very similar to the one to which I have just referred, when persistence of bleeding on a milk diet for twenty-seven days was taken as an indication that malignant change had set in. However, operation showed a callous ulcer that was not malignant. This supports the opinion of Billings, just quoted, rather than that of Boas, that such recurrent hemorrhage indicates ulcer carcinomatosum.

OCCULT BLOOD IN THE DIAGNOSIS OF CANCER. The rule which has been received until now and which I gave in *PROGRESSIVE MEDICINE*, December, 1904 and 1905, is, that occult bleeding occurs in every stool in ulcerated cancer. We find on further study that this statement needs revision. While it is undoubtedly true that bleeding from ulcerated cancers occurs much more frequently than from peptic ulcers, still cases have

¹ Loc. cit.

been noted by Ewald, as well as by myself, in which the bleeding from cancer was intermittent and even absent.

One of my cases was a young woman with pyloric obstruction, tumor of the pylorus, metastasis to the umbilicus, and finding of cancer at operation. Although she was under observation for a month in the medical ward occult blood did not appear in the stools until a week before operation. Another case was an old woman with pyloric tumor, pyloric obstruction, and cachexia who never showed occult blood. The mass was almost certainly cancer but unfortunately we could not verify the diagnosis.¹

Ewald has had the same experience and says that occult bleeding occurs in the majority but not in all cases of cancer, and often does not appear until other unmistakable symptoms are present. This is because bleeding does not take place until the tumor has ulcerated, a condition that does not always occur. He quotes the following case: A. S., aged fifty-five years. There was a tumor the size of a hazel-nut at the pylorus with slight retention and the presence of lactic acid. Hydrochloric acid was absent and there was no blood in the gastric contents. On January 18 and 23 and February 2 and 5 occult blood was absent. On February 10 an operation showed typical cancer of the pylorus.

THE THERAPEUTIC USES OF THE TEST FOR OCCULT BLEEDING Further study of the significance of occult blood reveals many ways in which the routine examination for it may be of help in diagnosis and therapeutics. Thus we can determine the propriety of passing the stomach tube in a case of suspected ulcer by the presence or absence of blood in the stool. Larger hemorrhages may be predicted and prevented by finding that occult bleeding is increasing in frequency and amount in a case of gastric ulcer. I have seen a typical case of this sort: A woman had had frequent attacks of hematemesis some two months before coming under observation. Her stools were free of blood for two months and she was improving in weight and strength when she began to complain of precursory symptoms of internal hemorrhage, namely, flushing, internal restlessness and pain and tenderness in the epigastrium. A clear reaction for occult blood was obtained in the feces for several days. She was put at rest in bed upon a milk diet. Her symptoms subsided and in a few days her stools were free from blood. It seems probable that this case was saved from serious hemorrhage by the routine examination for occult blood and prompt treatment.

An almost exactly parallel case is reported by Ewald.²

The test for occult blood can be used to control and determine the

¹ These cases were observed in the service of Prof. Stengel, Hospital of the University of Pennsylvania. I wish to express my appreciation of his courtesy in allowing me to refer to them.

² Loc. cit.

length of the various periods of medical treatment of ulcer. As a rule, bleeding should stop within a week after the patient is placed on a milk diet and rest in bed. As soon as blood disappears from the stools, provided the other symptoms are favorable, the diet may be increased. If bleeding recurs during the period of increase in diet, it indicates that the change is being made too rapidly. Persistent recurrence of hemorrhage, when the change from liquid to solid food has been tried a number of times, would indicate that the ulcer will not heal with medical treatment, and that surgical intervention is required.

Another prophylactic indication is to watch the cases of ulcer that are apparently cured in order that signs of impending relapse may be detected and recurrence prevented. Boas advises the routine examination of the stools of such persons at intervals for some months until the continued absence of blood shows complete healing. He says that by preventing hemorrhage and relapses, our chances of permanently curing ulcer by medical treatment will be much increased.

CIRRHOSIS OF THE LIVER CONFUSED WITH GASTRIC ULCER. The remark that I made in my article in *PROGRESSIVE MEDICINE*, December, 1905, namely, that cirrhosis of the liver is one of the conditions that would lead to confusion in the diagnosis of gastric ulcer, appears to have been warranted by the experience of others.

The reasons why such confusion should arise are that bleeding, visible or occult, is a prominent symptom of both ulcer and cirrhosis. Moreover in certain forms of both conditions there are no other decided symptoms except bleeding. Thus in cirrhosis when deep collateral circulation is well established there are often no systemic symptoms, except indefinite manifestation of dyspepsia—and most of the characteristic objective signs are also wanting, namely, enlarged spleen, ascites and abdominal varices. Under such circumstances the only symptom is occasional occult or massive gastrointestinal hemorrhages.

Gastric and duodenal ulcer as well may be in a latent state and manifest themselves suddenly by hemorrhage and in no other way. Thus the diagnosis between cirrhosis and latent ulcer may be extremely difficult. The moral for us is to use great care in excluding all other possible conditions before making a diagnosis of ulcer from hemorrhage alone.

William J. Taylor¹ reports a case of cirrhosis resembling duodenal ulcer where a man, aged forty years, of exemplary habits had a succession of terrific gastric hemorrhages. In the absence of any other sign of cirrhosis and especially because of the absence in the history of the usual causes of such a condition, a tentative diagnosis of gastric ulcer was made. At operation no ulcer was found, but a gastroenterostomy was done

¹ Jour. Amer. Med. Assoc., May 12, 1906.

with apparent success, since the bleeding stopped at once and the patient gained in flesh and strength. In ten weeks, however, the hemorrhage returned and the patient bled to death. Autopsy showed no ulcer, but typical atrophic cirrhosis with very good deep collateral circulation and erosion of the esophageal plexus.

I have reported a case with fairly distinct signs of duodenal ulcer in which the bleeding was extreme and was probably responsible for the patient's death. An operation, undertaken as a last resort to stop the bleeding, showed a duodenal ulcer but also an advanced atrophic cirrhosis, with very good deep collateral circulation. There were no signs of portal obstruction, unless the profuse hemorrhage could have been so considered.

Ewald reports a similar case in which the massive hemorrhage was heralded by occult bleeding. Ewald also mentions a number of conditions that in his experience have made difficult the correct interpretation of occult hemorrhage. Such are hemorrhoids high in the rectum, tuberculosis of the intestine, typhoid fever, and various septic processes. He mentions one case of a man, aged forty-nine years, who came under observation with fever and enlargement of the liver of doubtful origin. The presence of occult blood in the stools led to a tentative diagnosis of cancer of the bowel with metastasis to the liver. Autopsy showed an old appendicular abscess, thrombophlebitis, and abscess of the liver. The stomach and intestine were free from disease.

A NEW TEST FOR OCCULT BLOOD. A new method has been devised by O. and R. Adler, and has been tested clinically by Schumann and Westphal. It consists in the use of a concentrated alcoholic solution of benzoidin instead of guaiac or aloin in the Weber test.¹ In the presence of blood-coloring matter the reagent turns an intense green. The reaction responds to human blood in a dilution of 1 : 200,000 while the delicacy of the other reagents (aloin and guaiac) is but 1 : 25,000. I have no practical experience as yet with this modification of Weber's test. Ewald has found that it is extremely delicate, indeed, almost too much so for clinical use.²

¹ PROGRESSIVE MEDICINE, December, 1905.

² The following articles relating to occult blood have recently appeared: Ewald, and Berl. klin. Woch., 1906, Nos. 9-10. Boas, Deut. med. Woch., 1906, No. 18. O. R. Adler, Ztschr. f. Physiolog. Chemie., Band xli, Heft 1 and 2, p. 59. Schumm and Westphal, Ibid., Band xlvi, Heft 5 and 6, p. 510. von Torday, Wien. klin. Rundschau, 1905, xix, No. 26-27. Siegel, Munch. med. Woch., 1905, No. 33, p. 1579. Steele, New York Med. Jour., January 20, 1906. Steele, Univ. of Penna. Med. Bulletin, July, 1906. Tileston, Boston Med. and Surg. Jour., July 12, 1906. Benedict, New York State Jour. of Med., May, 1906. Romani, Riforma Medica, February 3, 1906. Zuccola, Clinica Medica Italiana, April, 1905, p. 193. Cattaneo, Rivista Critica di Clinica Med., November, 1905, p. 713. F. W. White, paper read in Medical Section, Fifty-seventh meeting of Amer. Med. Assoc., 1906. Friedenwald and Rosen, New York Med. Jour., August 11, 1906.

Gastric Secretion. The modern development of gastric therapeutics dates from the discovery that gastric secretion varied within wide limits under different circumstances. An elaborate clinical pathology was built upon what was known of gastric chemistry and what was supposed to be the effect of the variation in gastric secretion, especially of the hydrochloric acid. Indeed, our present clinical conception of gastric disease still rests largely upon gastric chemistry. This was but natural because it was at first very easy to offer apparently satisfactory explanations for many symptoms by assuming that there were definite limits for normal secretion and that when hydrochloric acid fell below or rose above these limits certain disturbance in digestion or sensation were sure to follow. However, when an attempt was made to apply these principles to gastric therapeutics, it was discovered that while many gastric symptoms could be alleviated by correcting gastric secretion, still very often the results of treatment based upon gastric chemistry alone were very poor. Moreover, it was found that absence of gastric secretion could exist without any appreciable disturbance of digestion. It was but natural under these circumstances that there should be a reaction against the importance that had been laid upon variations in gastric chemistry. Many clinicians went to the other extreme and assumed that gastric digestion was unimportant and could be dispensed with altogether without injury to the organism. The question of gastric motor insufficiency then came into prominence and by the help of surgery we began to realize the advantages of proper drainage of the stomach. When we consider these steps in the development of modern clinical knowledge of the gastrointestinal tract, it is easy to understand how the operation of gastroenterostomy came into such sudden favor and why its range of usefulness was thought at first to be so very extended, so that there was hardly any gastric disturbance that was not deemed to be capable of improvement by gastric surgery. It was argued that if gastric digestion was unimportant and gastric drainage was very essential, then a gastroenterostomy could not help being of benefit in almost any case. However, the experiments of Pawlow and his followers have shown that digestion as a whole is very much more complex than we had thought, and that the gastric, pancreatic, hepatic, and intestinal functions are very intimately related and interactive, so that the full activity of any one function is generally dependent upon the activity of some other. Consequently, we have learned theoretically by experiment and are beginning to learn by clinical experience that it is dangerous to unbalance such a delicate mechanism as digestion, in which each part depends for its proper activity on the continuity of some other part.

As a result of the increase in our knowledge of the process of digestion as a whole the gastric secretion takes on a new importance and we have learned that it may not be disregarded with impunity. On the other hand,

we find that the hydrochloric acid secretion may vary in health within very wide limits, and that we do not yet understand the significance of gastric acidity and its relation to gastric symptoms. Fortunately there has appeared during the past year a most concise and fair *resume* of the subject of lowered gastric secretion in the form of a paper by Charles G. Stockton.¹

I am most fortunate in being able to present the subject to the readers of *PROGRESSIVE MEDICINE* in such a form, and I venture to quote his paper almost entire, since to paraphrase it would only impair its clearness and brevity.

THE IMPORTANCE OF GASTRIC SECRETION. There are reasons why the reopening once more of the old question of lowered gastric secretion is appropriate and not quite unnecessary, and one of these reasons is the apparently growing belief that the digestive power of the stomach is not really important to the well-being of the organism and that it may be dispensed with without inconvenience. This is a period in which we see many patients who have undergone the operation of gastroenterostomy for the relief of some one of the several gastric diseases, and in these patients, through the absence of pyloric restraint, the stomach empties itself rapidly before the lapse of sufficient time for proper gastric digestion. It is claimed by some that the intestine is competent to digest the food without the assistance of the stomach and that, practically, the office of the stomach might be dispensed with altogether. In a recent discussion before the American Medical Association, one of the best-known clinicians of the country seemed to support this view, and only one protest was heard. It seems of some importance to examine this question and to inquire into the importance or necessity of gastric digestion and especially to consider a large group of cases in which gastric secretion is absent or below the recognized standard.

Attention is directed to the discovery of Hirsch and Von Mering, whose work has been repeated and confirmed by Pawlow and others, which shows that a fundamental relation exists between active gastric secretion and the motor function of the stomach and duodenum, and also between gastric secretion and the secretory functions of the intestine, pancreas, and liver. As soon as a small portion of the acid gastric juice escapes through the pylorus into the duodenum, a reflex arising in the latter leads to the closure of the pylorus and the prevention of the further escape of gastric contents. This modicum of the gastric juice, now present in the duodenum, stimulates the secretion of pancreatic juice, bile and succus entericus, from the alkalinity of which the gastric juice in the duodenum is neutralized. Thereupon the pylorus again opens, the propelling movements of the stomach are renewed and another portion of acid gastric juice is discharged into the

¹ Pennsylvania State Medical Journal, February, 1906.

duodenum. As a result the pylorus is again reflexly closed, the discharged gastric juice is again neutralized, and so on. Thus we see an intimate relation between the movements and the emptying of the stomach and that of the normal activity of the gastric secretion. Bayliss and Starling have shown that the presence in the duodenum of acid gastric juice excites the secretion of *secretin*. This substance, passing into the blood, acts directly upon the pancreas and through its presence stimulates the pancreatic secretion. It will thus be seen that the intermittent and regular discharge of acid gastric juice into the duodenum is the normal stimulus of the pancreatic secretion. Pawlow and his students have shown that the substance known as enterokinase is present in the succus entericus and that by the action of this enterokinase upon the trypsinogen in the pancreatic secretion, trypsin is produced, and thus only. They show that trypsinogen is incompetent in the digestion of proteid, but that it becomes activated through the intervention of enterokinase, thus forming trypsin which, as is well known, is powerful in proteid digestion. Hence it follows that the gastric secretion not only regulates the movements of the stomach, but stimulates the secretion of the pancreatic juice and, therefore, has much to do with intestinal digestion.

CAUSES OF LOWERED GASTRIC SECRETION. Lowered gastric secretion is the expression of varied pathological processes. We recognize that it follows, first, acute and chronic inflammatory states of the gastric mucosa; second, atrophy of the gastric mucosa from any cause whatever; third, from general or systemic functional depression; fourth, as the expression of a gastric neurosis; fifth, as a congenital peculiarity. When it occurs as one of the manifestations of either acute or chronic catarrhal gastritis, the depression of secretion may be temporary. In not a few cases, however, even when the underlying causes of the gastritis are apparently removed, the gastritis may smolder, continuing until the glands of special secretion are destroyed and replaced by other tissue, so that the secretion of the stomach thereafter remains merely a watery mucus containing no trace of hydrochloric acid or enzymes. There is a group of cases in which we find that the gastric secretion has disappeared and no explanation of the fact may be found in the previous history of the case. We describe such as instances of achylia gastrica, but the real nature of the process is not always understood. It is a well-known fact that when malignant disease involves the gastric walls it is accompanied by a rapid falling off of gastric secretion, and somewhat less rapid, but no less certain, disappearance ensues in the presence of grave cachexias, even when the stomach is not immediately involved, as, for instance, in carcinoma, pernicious anemia and advanced diabetes. It is well recognized that long-continued general depression is usually accompanied by corresponding depression in gastric secretion. This conception of the situation is well

fixed in the mind of the general practitioner, who is always solicitous when dealing with debilitated patients lest the stomach should fail. In a certain proportion of these cases the secretion entirely disappears, usually, however, to return with the restoration of health, although sometimes hyposecretion or achylia gastrica continues.

Lowered gastric secretion occurs in certain neurasthenics, and we sometimes find in neurotic patients a singular alternation between hypersecretion and hyposecretion without any apparent reason. The occurrence of this lends ground to the notion that achylia gastrica may in some instances depend upon disturbed innervation of the stomach. Doubt has been expressed regarding the justice of this view, and undoubtedly it should not be accepted until all other possible causes have been excluded. It is probable that the secretions of the stomach are sometimes inhibited through profound nervous disturbance, and we know that this occurs in hysterical patients as well as in some instances of disease of the brain and spinal cord. When as a result of arteriosclerosis the blood supply of the stomach is limited, it is reasonable to expect a diminution of secretion as well as the appearance of sensory and motor disturbances of the stomach.

From this varied array of conditions in which lowered gastric secretion is a more or less constant accompaniment, it will be seen that the condition is a common one. The question arises as to its importance and the well-being of the patient in whom it exists.

LOWERED GASTRIC SECRETION OFTEN A CONSERVATIVE PROCESS. In reviewing the matter, one fact stands out prominently, and that is that the decrease of gastric secretion cannot be looked upon in the same light in all cases. That is to say, it is at times an advantage, and it is improper in this matter to speak in general terms. For instance, in acute catarrhal gastritis, the presence of high gastric secretion would greatly increase the irritability and intolerance of the stomach, the spasm of the pylorus, the suffering of the patient, and the delay in convalescence. In the cyclic vomiting of children, perhaps the most important factor in the persistence of the attack depends upon the high gastric secretion which belongs to it, and hence the inability of the pylorus to relax so as to favor the passage onward of the stomach contents. In point of fact in most cases of inflammation of the gastric mucosa, the secretion grows less in proportion to the intensity of the inflammation, and such acids as are present are likely to be organic in nature. It is desirable under the circumstances that the secretion of acid gastric juice be low, and no effect should be made to stimulate its reappearance. In chronic catarrhal gastritis the same principle holds true in most cases. Unless atrophy of the specific glands has occurred, the mucosa may be expected to secrete actively enough to satisfy the best interests of the patient. It is true that sometimes congestion and irritation of the stomach considerably subside, while the secretion

remains absent. In such cases the administration of hydrochloric acid and pepsin is allowable. On the whole, we may conclude that lowered secretion is a wise provision in inflammatory states of the stomach. On the other hand, in achylia gastrica, without gastritis or other demonstrable lesions of the mucosa, the return of secretion is not only desirable but is practically the only matter to which the therapist turns his attention. Among these cases a large proportion suffer from very imperfect intestinal digestion with intervals of diarrhea, the stools containing much undigested material, especially of a proteid nature. The explanation of this is found in a lack of acid gastric juice which, normally, acts to restrain the rapid emptying of the stomach as well as to stimulate the intestinal digestion of proteids before alluded to. It is true that the restoration of secretion is rarely brought about by the administration of hydrochloric acid and pepsin or by the local stimulation of the stomach, and yet enough acid may be administered to excite the secretion of secretin, thus helping the intestinal digestion; also the acid, with the help of local stimulation of the stomach, leads to more normal closure of the pylorus. While, undoubtedly something can be done by local treatment, real benefit also follows a wisely directed general course looking to the improvement of the organism as a whole.

The disappearance of hydrochloric acid in malignant cases, while an item of ill omen in prognosis, undoubtedly makes for the comfort of the patient. Although, theoretically, gastric digestion would proceed more perfectly with ample secretion, we must not overlook the fact that such secretion would greatly irritate the mucosa and cause pain and increased motor disturbance. An open pylorus is to be desired in gastric carcinoma. It is, therefore, injudicious to administer hydrochloric acid in cancer of the stomach. We should direct our efforts toward favoring the prompt evacuation of the organ. When obstruction occurs in these malignant cases gastroenterostomy is most desirable.

LOWERED GASTRIC SECRETION OF SERIOUS CLINICAL SIGNIFICANCE. When the gastric secretion disappears in pernicious anemia and other cachetic states there is no doubt as to the ill effect which it has on the general nutrition. It is a mistake to flatter ourselves that the intestine will prove competent to carry on the necessary digestion. For, in these conditions, when the gastric secretion fails the secretions which are necessary for good intestinal digestion are also unsatisfactory. It is well, under these circumstances, to assist the digestive apparatus as a whole, and the activity of the gastric digestion may be looked upon somewhat as an index to the digestion in other parts. This is a place for the use of hydrochloric acid and the ferments, for peptonized foods, and a very nutritious and easily assimilated diet. Stockton has elsewhere¹ reported studies

¹ PROGRESSIVE MEDICINE, December, 1904.

upon the gastric digestion of twenty-five cases of pernicious anemia in which it was found that the gastric secretion, having once disappeared, was not restored again even though the blood rose as it did in some instances, to the normal standard.

THERAPEUTIC VALUE OF HYDROCHLORIC ACID. In the discussion of this paper, Dock called attention to the good effect which followed the taking of hydrochloric acid in pernicious anemia. This is not hard to understand in the light of the observations of Pawlow, Starling, and von Mering. It is because it assists the intestinal digestion. The permanent disappearance of hydrochloric acid does not apply, however, to all cachectic states, and occasionally we will find that the full restoration of gastric digestion will take place in patients who have been for a long time absolutely without any gastric secretion whatever. Such are not true cases of achylia gastrica, so-called, but are instances of the failure of a function, the result of a serious but not permanent general depression.

LOWERED SECRETION A MANIFESTATION OF LOWERED VITALITY. This brings us to the consideration of a large group of cases in which lowered gastric secretion is but one of a train of depressed functional activities which result from impaired vitality. It seems to me that there can be no doubt as to the ill effect of this lowered gastric secretion upon the general health of the individual. Not only is the motor function of the stomach poorly performed, but we have also to deal with the problem of an over-taxed intestine which lacks the normal stimulus of properly prepared contents, including the acid chyme which should be discharged from a healthy stomach. When physicians come to pay sufficient attention to the investigation of the stools, they will find that poor gastric digestion usually means imperfect intestinal digestion. In these cases there is a wide field for the careful application of dietetics, so arranging matters that functional strains may be avoided as far as possible, that the secretion and motion of the stomach may be assisted with the fullest diet practicable, and that due consideration be given to the number of calories ingested.

In this connection, it should be remembered that a really scientific estimate of the amount of food in calories required for a given individual cannot be definitely established except one estimates the state of the intestinal digestion as shown by the stools, and the extent of assimilation as shown by the increase or decrease in weight of the body. A still more exact criterion may be found in estimating the total nitrogen output in the urine and stools, in connection with the knowledge of the amount ingested and the changes in body weight.

In reviewing a large number of cases which have been studied, some of them for a period of more than fifteen years, Stockton is convinced that the rule may be laid down that in the absence of, or with, a very low

standard of gastric secretion, we almost invariably find individuals with impaired health. This holds true often when the intestinal digestion is relatively good. He is aware that in a large number of cases there appears to be a decline in general health from some other causes and the lowered gastric secretion follows merely as a result. But, on the other hand, there are many cases in which we are unable to detect any systemic disease, but in which there seems to be a low grade of nutrition accompanied by an inferior gastric digestion and in which the general health seems to be impaired from imperfect assimilation. Furthermore, it is not unusual to find improvement taking place in the general health synchronously with the restoration of gastric secretion. Experience forces Stockton to conclude that the stomachic digestion is of great importance. It seems to me that this question should be considered when deciding upon what operation should be selected for the re-establishment of an adequate gastric drainage.

GASTRIC SURGERY REGARDED FROM A STANDPOINT OF PHYSIOLOGY. Unquestionably, it is better that gastroenterostomy should be performed rather than that the patient should continue to suffer from the miseries which food stagnation from obstruction invariably entails. But it has been Stockton's experience that a more normal gastric digestion is likely to ensue after a pyloroplasty than after a gastroenterostomy. He does not decry the latter operation, but the objections which have been raised against pyloroplasty have not been apparent in patients coming under his observation, and he has clinical as well as physiological reasons for believing that eventually we shall see more effort put forth to preserve the delicate complimentary mechanism which resides in the pylorus and upper duodenum. In other words, he predicts that some form of pyloroplasty will replace gastroenterostomy in cases where it is practicable.

The Clinical Significance of High Hydrochloric Acidity. We have seen that it is the tendency at present to rather underestimate the importance of lowered gastric secretion. On the other hand, it seems probable that as a rule we have overestimated the importance of high hydrochloric acid secretion. There are cases in which there is a true hyperchlorhydria, that is when gastric discomfort is due distinctly to an excessive secretion of acid and where hyperchlorhydria is the primary condition and the gastric irritation is secondary to it. This is the case in ulcer and in hypersecretion whether this be a primary neurosis (continuous hypersecretion) or whether it be due to the irritation of stagnation or an ulcer.

PRIMARY HYPERCHLORHYDRIA. I do not doubt, moreover, that in rare cases there is such a condition as primary hyperchlorhydria of functional origin, and that the gastric irritation seen in these cases is due primarily to the excess of acid. These are, as I have said, rare, but several observers whose experience and scientific training render their opinion of excep-

tional value have told me that they have seen such cases. They are probably a form of primary secretory neurosis of the stomach. A case needs to be thoroughly studied before such a diagnosis can be made, however, and the presence of hypersecretion must be excluded most carefully.

We must remember that the symptoms of hypersecretion differ from those of hyperacidity only in being more severe and more obstinate and the two conditions may be easily confused.

This discussion may seem academic, but, as I shall try to show, it is really most practical and important, especially from a therapeutic standpoint. I have been especially interested in the subject and considered it in a paragraph under "Gastric Hyperesthesia" in *PROGRESSIVE MEDICINE*, December, 1905. In a paper read before the Medical Section of the Boston Meeting of the American Medical Association, I endeavored to determine the true clinical relationship between gastric hyperesthesia and high acidity.

THE RELATION OF HIGH GASTRIC ACIDITY TO GASTRIC SYMPTOMS. It is a well-established fact that symptoms of gastric irritation similar to those of hyperacidity may occur not only when the acid of the gastric secretion is excessive but often when it is normal or subnormal. Stockton pointed this out in 1902,¹ and explained the condition by assuming that there was a hyperesthesia of the gastric mucous membrane which caused it to be intolerant, not only of abnormally large amounts of acid, but often of a normal or subnormal amount, or, as he puts it, persons without an excess of acid had symptoms of hyperacidity.

It is the opinion of von Noorden, Riegel, and others, including myself, that excess of acid alone is not capable, as a rule, of producing the symptoms of gastric irritation seen in so-called hyperacidity. But that there must be some other condition present which renders the gastric mucous membrane more sensitive than usual, so that it cannot stand an amount of acid that would be easily tolerated if the mucous membrane were in a normal condition.

DEFINITION OF SO-CALLED HYPERACIDITY SYMPTOMS. Before going farther it may be well to state exactly what is meant by hyperacidity symptoms. The most characteristic of them is the discomfort or burning, often amounting to pain, which comes on about the height of digestion one or two hours after eating, and is relieved by food, alkalies, liquid, or vomiting. There are other less constant symptoms, such as sour eructations, belching, excessive appetite, and nervous manifestations, but the most important and characteristic one is that mentioned first.

The simplest explanation for the peculiar pain of hyperacidity is that

¹ Jour. Amer. Med. Assoc., January 11, 1902.

it is caused by the excessive amount of hydrochloric acid in the gastric secretion. The pain comes on sometimes after eating, because while there is food present in the stomach, the acid unites with it and there is no accumulation of free acid. But as soon as the food has taken up all the acid that it can, then free acid accumulates and irritates the gastric mucous membrane. The pain is relieved by more food or alkalies, because by them the acid is neutralized, and liquids and vomiting relieves it because they dilute or remove the excess of acid.

THE OCCURRENCE OF HIGH ACIDITY WITHOUT GASTRIC SYMPTOMS. This very simple explanation of the causation of pain in hyperacidity ceases to explain when we find that the acidity of normal stomachs varies within very wide limits under the influence of locality, diet, and modes of living; and as the number of observations of normal gastric juice multiplies, the wider do these limits become. Thus the per cent. of hydrochloric acid in normal persons may run far beyond what we formerly supposed to be the upper limit of health, and the same thing is true in patients with other diseases without gastric symptoms.

I myself have seen three cases with acidities over 70 without gastric symptoms. Stockton has repeatedly found high acidity, even to 100, without symptoms.

Kaufmann,¹ in 19 cases free from gastric symptoms found that 10 of them had a total acidity above 70, and 2 over 100. Kaufmann also found that he could give hydrochloric acid to healthy persons, thereby much increasing the total acidity without the production of hyperacidity symptoms.

Gintls,² in Riegel's clinic, examined 40 patients without stomach symptoms; 3 had achylia without symptoms. In the remaining 37 there were 27 constantly over 60, 1 inconstantly; 17 constantly over 70, 1 inconstantly; 8 constantly over 80; 4 constantly over 90; 1 constantly over 100.

Schule³ found higher limits than normal in 10 normal cases.

Similar observations have been made by Meyer,⁴ Sorensen and Brandenburg,⁵ and Illoway.⁶ These observations show quite clearly that an excess of acid in itself is not sufficient to produce the symptoms of irritation in conditions that we call hyperacidity. But there must be in addition an intolerance of the mucous membrane for the acid. These remarks must not be interpreted that the pain is not due to the irritation of the hydrochloric acid. The part played by the acid of the gastric contents

¹ *Ztschr. f. klin. Med.*, 1905, vol. lvii, p. 491.

² *Archiv f. Verdauungskrankheiten*, 1898, vol. iv, p. 251.

³ *Ztschr. f. klin. Med.*, 1895, vol. 23, p. 461.

⁴ *Archiv f. Verdauungskrankheiten*, 1900, vol. vi, p. 299.

⁵ *Ibid.*, 1897, vol. iii, p. 377.

⁶ *Ibid.*, 1902, vol. viii, p. 103.

is a very important one, for it is the direct cause of the irritation although it cannot produce this irritation unless the mucous membrane is unduly sensitive.

HYPERACIDITY SYMPTOMS WITH MODERATE OR LOW ACIDITY. My analysis of thirty cases with hyperacidity pain shows quite clearly that the irritation occurs not only when the per cent. of acid is high, but even when the acid is within the so-called normal limits or subnormal.

In speaking of the acidity of the gastric contents I have tried to avoid as much as possible the terms hyperacidity, normal acidity, and subacidity. As I have shown there is good reason to believe that these terms are misleading in that they assume that acidities above or below certain arbitrary limits are necessarily pathological. Whereas both high and low acidity may be compatible with perfect health. I have instead used the terms acidities of the upper, middle, or lower grades. The first would include all cases with total acidities above 60. The second between 30 and 60; and the third under 30.

I have assumed that the total acidity fairly represents the hydrochloric acid secretion, provided it can be shown that there is no decided amount of organic acid present. Almost all my cases were examined more than once and with different meals, and I have not attempted to draw sharp distinctions, but have tabulated each case where the general average of examination showed it to belong. Most of my records were taken before my attention was particularly called to the point I am discussing, and so I hope that suggestion has played little or no part in eliciting the character of pain from which each patient suffered.

HYPERSECRETION AND RETENTION AS A CAUSE OF GASTRIC IRRITATION. In about one-half of my cases the cause for the irritation and pain lay in the existence of decided gastric motor insufficiency or of hypersecretion. Kaufmann also found that these two conditions were important factors in the production of the form of gastric pain that has been described. In both conditions the lining of the stomach is exposed to the action of the gastric juice longer than is normal, and it seems probable that this may make it intolerant of the acid in the retained contents. This would cause discomfort coming on after the height of digestion.

In my list, three cases had undoubted signs of alimentary hypersecretion; namely, pain at night, aggravated symptoms of irritation, and excess of fluid in the gastric contents after a test meal. No fluid was found in the fasting stomach over night, indicating that the hypersecretion was not continuous.

Ten cases had decided retention as shown by the presence of food in the stomach four or five hours after an ordinary meal, and by the demonstration of dilatation. Kaufmann found dilatation of the stomach thirty-five times in fifty-three cases with hyperacidity symptoms, which is a

considerably larger proportion than in my series. He found that the signs of irritation disappeared as the atony disappeared.

HYPERESTHESIA OF THE GASTRIC MUCOUS MEMBRANE AS A CAUSE OF HYPERACIDITY SYMPTOMS. In the remaining fourteen cases of my list no cause could be demonstrated for the hyperesthesia. In seven of them the acidity was of the higher grade and in the other seven of the lower and middle grade, including one case of achylia. In the case of achylia, even the ferments were absent from the gastric contents. The patient suffered much from pain, especially two hours after meals. No retention could be demonstrated. He was temporarily relieved by bromides and finally recovered and gained weight under a liberal diet and the rest cure.

In almost all of these cases the gastric symptoms were directly connected with over-fatigue or worry, or were a part of the general nervous irritability. In all of the patients the gastric symptoms improved and finally disappeared under a treatment directed toward relieving the nervous strain and raising the level of nutrition without paying much attention to the condition of the stomach. The result of the treatment, quite as much as anything else, would indicate that the hyperesthesia in these cases was a local manifestation of a general nervous irritability. That is, it was a sensory neurosis of the stomach. This is the view taken by Kaufmann, Stockton, and Musser,¹ who report a series of similar cases. It is, of course, very hard to prove definitely the existence of a pure neurosis. One may question whether the neurasthenia, instead of being the cause, may not be the result of the gastric disturbance. However, the presence of a sensory neurosis seems to best explain the questions that we have been considering: namely, first, why acidity of a higher grade may exist without symptoms; and second, why hyperacidity symptoms occur with acidity of the middle or lower grades in cases in which there is no retention, ulcer, or hypersecretion.

CLINICAL IMPORTANCE OF HYPERESTHESIA OF THE STOMACH AND ITS BEARING UPON TREATMENT. The clinical lesson for us in this is that we must not be surprised or thrown off the track in such cases when with the clinical picture of hyperacidity we find normal or subnormal gastric secretion. Moreover, it seems probable that it is a hyperesthesia and not an acid secretion at all that we influence by our treatment when we relieve hyperacidity symptoms. This is almost certainly true in the cases where the acidity is of the middle or lower grade, for then we cannot hope, nor would we wish to, permanently reduce an acidity that is already low.

Indeed, it seems doubtful whether we can expect to permanently influence the secretion of acid. Where the acidity is of the higher grade it

¹ Trans. of the Assoc. of Amer. Phys., 1905, p. 193.

has always been the aim of the therapist to give remedies that will reduce secretion. Thus, Riegel¹ and Pirrone² have shown experimentally that atropine has a decided effect in reducing hydrochloric acid secretion. However, Riegel and Walko say that this effect is only transient and that the secretion is not permanently affected. The same is true of the use of oil.³ I do not know of any systematic series of observations upon the question of whether the acidity is lowered permanently when an attack of hyperacidity symptoms is relieved. Riegel infers that the secretion is not permanently affected; and Kaufmann⁴ says certainly that it is not affected, but does not give figures. If it is true that treatment has no permanent effect upon the acid then this is a very strong argument in favor of the view that it is the hyperesthesia and not the acidity that we influence by treatment. I can give no data upon this point but suggest the subject as a fruitful field for research.

If what I have said is true, namely, that the hyperesthesia rather than the acidity is the point of attack in our therapeutics, then considerable light is thrown upon the treatment of the condition. In the first place the necessity of correct diagnosis is made manifest and emphasized. It especially is of great importance to determine whether the symptoms of irritation are due to ulcer, retention or hypersecretion on the one hand, or to a sensory neurosis on the other. The first three conditions have their own methods of treatment which need not be considered here. When the hyperesthesia is due to a sensory neurosis, the treatment must consist in the removal of the general nervous irritability by improving nutrition, eliminating as far as possible the cause of worry and fatigue, and by rest, hydrotherapy and other measures usually employed for this purpose. In this manner alone can the gastric symptoms be permanently cured.

THE BEARING OF HYPERESTHESIA UPON DIET. If hyperesthesia rather than acidity is the point of attack, then the controversy that arose at one time concerning the proper diet for hyperacidity is explained. One school favored a carbohydrate diet because it was supposed that carbohydrates did not offer as much stimulus to hydrochloric acid secretion. The other school used an almost exclusively proteid diet in order to take up and neutralize as much acid as possible by the power that the proteid possessed of combining with the free hydrochloric acid. Neither extreme was found to give very good results, and gradually experience has shown that the best diet is a liberal mixed one containing rather a high proportion of fats and proteids, and given in as unirritating form as possible. Regarded from the standpoint of the treatment of

¹ Deut. med. Woch., May 12, 1904, No. 20.

² Riforma Med., August 12, 1903, p. 879.

³ Riegel, loc. cit.

⁴ Loc. cit.

hyperesthesia of a nervous origin this liberal and unirritating diet would be the most suitable one. Its liberality would improve nutrition and in this way help general nervous irritability.

But whatever is the composition of the diet, the all-important point is that it should offer no irritation to the already oversensitive mucous membrane. Whether proteids or carbohydrates predominate must be decided by the amount of acid secreted and by the state of the intestinal digestion, as shown by a study of the stools. But it is very necessary that all food be given in such a form as to produce the least possible irritation. The diet must be liberal enough to raise the general level of nutrition. Proteids and fats are excellent food for this purpose and this is probably the reason why the mixed diet is the one that has given the best results. Thus the diet which has proven to be the best for cases of irritation with high acidities gives nearly as satisfactory results with moderate or lower grades of acid. This is not because it is best suited to neutralize the free acid or to inhibit its secretion, but because it is nourishing and not irritating and by raising the level of nutrition helps and cures the sensory neurosis.

THE USE OF ALKALIES AND OTHER DRUGS IN HYPERESTHESIA. Much the same thing is true about the various remedies used to relieve the pain in cases of high acidity. As has been said the acid of the gastric contents is directly responsible for the irritation, although it cannot produce this irritation unless the mucous membrane is unduly sensitive. Therefore, to relieve the pain the acid must be neutralized after the height of digestion. This applies not only to the cases of high grades of acid but also to those with middle or low grades, although not to the same extent. The neutralization is of course required by the administration of alkalies at about the time that the pain would otherwise appear. In the same way in the high grades of acidity, such a drug as atropine which temporarily inhibits hydrochloric acid secretion, helps relieve the source of irritation and the hypersensitive mucous membrane to recover its normal resistance.

In my experience the various nervous sedatives, such as bromides, valerianates or sumbul, have proved very useful in temporarily relieving the discomfort in these cases with irritative symptoms. Of course, in the lower grades of acidity sedatives are relatively more valuable than the alkalies, for obvious reasons. In the rare cases of achylia with hyperacidity symptoms they are the only means of relief, since here, of course, the question of acidity plays little or no part in the production of symptoms. In the cases of achylia the question of atony must be most carefully considered. In my case the stomach emptied itself rather more promptly than normal and the discomfort was apparently due to a true sensory neurosis.

THE USE OF NUX VOMICA IN HYPERESTHESIA. I wish to refer to a paper read by Musser,¹ in which he suggests nux vomica in doses ascending slowly to the physiological limit as a remedy for these cases of hyperesthesia. He says that nux vomica is theoretically contraindicated in cases of hyperchlorhydria on account of its supposed action in increasing the secretion of acid, and as D. D. Stewart stated in the discussion, this has been the received opinion. However, Musser said that he has had uniformly good results from the use of the drug in those cases in which the symptoms of hyperacidity were apparently due to a sensory neurosis.

The beneficial effects of nux vomica in spite of its apparent contraindication to its use in cases of hyperacidity symptoms, are perfectly explained when we consider that it is a sensory neurosis that we are treating and not an irritation entirely due to a temporary increase in gastric acidity.

My own experience has shown that nux vomica given, as Musser suggests, is an excellent remedy in these cases where we are attempting to remove a local neurosis by increasing the general nervous stability of the individual.

THE INFLUENCE OF HYDROCHLORIC ACID UPON GASTRIC SECRETION. I have frequently discussed the therapeutic uses of hydrochloric acid in the pages of *PROGRESSIVE MEDICINE*. I have always held that its administration was desirable in cases of lowered gastric secretion because of its antiseptic action upon the gastric contents and still more important because the activity of the pancreatic reflex depends upon the presence of free acid in the first portion of the duodenum. I quite appreciate the fact that the amount of hydrochloric acid normally secreted is so large that it is almost impossible to reproduce the normal gastric acidity by giving hydrochloric acid by the mouth, but I have always felt that the argument is fallacious which holds that because the digestive functions of the stomach can be assumed by the intestines in achylia without symptoms of gastric disturbance, there is no need of giving hydrochloric acid. I think the two reasons that I have mentioned for its administration are very important ones and I am glad to say that in this I follow the opinion of various high authorities. When we consider the matter closely we find that we have known very little about the influence of hydrochloric acid upon the gastric secretion. Whether we can hope to cause a lowered gastric secretion to return to normal by the use of hydrochloric acid, whether it is best given before or after meals, in what doses it has the best effect and so on.

Pawlow has shown in dogs by means of the gastric fistula and second stomach² that hydrochloric acid given by the mouth has absolutely no

¹ Trans. of the Assoc. of Amer. Phys., 1905, p. 193.

² *PROGRESSIVE MEDICINE*, December, 1903.

effect upon the secretory apparatus of the stomach and acts like so much water, but that it did have a very powerful effect in stimulating pancreatic secretion, as I have said.

During the past year Bickel¹ has published a series of observations upon the action of hydrochloric acid upon the stomach of a dog with a gastritis and lowered gastric secretion. This is a very valuable piece of work because it shows that the action of the acid upon the diseased mucous membrane is quite different from the way in which it acts upon the normal mucous membrane, and represents the conditions under which we almost always wish to use hydrochloric acid as a remedy. Bickel used the Pawlow gastric fistula and second stomach. The mucous membrane of the gastric diverticulum was undoubtedly the seat of a chronic gastritis and its secretion was much lowered. When food was given by the mouth no secretion of hydrochloric acid whatever followed in the smaller stomach and this observation was repeated frequently for a period of several weeks to eliminate error. However, when the animal was given 200 c.c. of a decinormal hydrochloric acid solution on the fasting stomach and this was followed an hour later with 200 c.c. of milk, then the secretion of the smaller stomach which had been alkaline or neutral became strongly acid. The total acidity during the three following hours was 40, 72, and 84, and the Mett tube showed good pepsin digestion. It must be remembered that the solution of hydrochloric acid that was poured into the larger stomach does not enter the smaller stomach and so the secretion of the smaller portion of the organ is, therefore, a true index of the activity of the gastric mucous membrane as a whole. These experiments show quite definitely that the administration of hydrochloric acid in a fasting stomach had a very decided stimulating effect upon the mucous membrane of a stomach that was the seat of a chronic gastritis and achylia. What is still more significant is the fact that the effect of the stimulation lasted until the next day. The fact that the effect of the acid persisted for twenty-four hours showed that the physical and chemical action of the hydrochloric acid stimulated the glands in such a way as to bring out their latent but depressed activity.

Heinsheimer² has repeated the same experiments with normal dogs and found as Pawlow did that hydrochloric acid when given one hour before meals has no more effect upon the normal mucous membrane than water.

THE METHOD OF ADMINISTRATION OF HYDROCHLORIC ACID. Bickel and Heinsheimer found that hydrochloric acid given with or after food had no stimulating effect either upon the normal or diseased stomach. This is a very important and practical point. The lesson for us then is

¹ Berl. klin. Woch., 1905, No. 28.

² Archiv. f. Verdauungskrankheiten, 1906, xii, 2.

that when we attempt to restore a depressed gastric secretion we should give hydrochloric acid an hour before food. The equivalent of 200 c.c. of a decinormal hydrochloric acid solution is approximately 117 minims of acid hydrochloric dilute (U. S. P.), and I imagine that the amount for a human being would be approximately this because the normal hyperacidity of a dog's stomach would offset the greater capacity of the human stomach. This is a much larger amount than is usually given, and emphasizes the fact that to get the best results we must increase our dosage of hydrochloric acid. Whether we need give these inconveniently large doses will be decided by clinical experience. Its best method of administration is to give 15 to 20 minims in one-half glass of water and repeat every fifteen minutes until the required amount is given. The mouth should be rinsed with plain water or soda and water to protect the teeth. I should think also that it might be well to give hydrochloric acid before meals to stimulate the gastric mucous membrane, and if the secretion is still low to augment it by hydrochloric acid given with meals, too, for although the latter mode of administration does not stimulate the mucous membrane, the added acid will help out the secretion that is still insufficient. This work of Bickel and Heinsheimer, if it is confirmed, shows definitely that the attitude that assumes that it is useless to give hydrochloric acid in achylia is wrong. Unless there is a definite atony of the glands, hydrochloric acid, if properly given, will tend to restore their secretory activity. Fortunately the cases of atrophy are rare and most cases of lowered secretion are a part of other depressing conditions, or as in the dog in Bickel's experiment, the result of a catarrhal inflammation. These latter should be amenable to treatment.

Sources of Error in the Investigation of the Functional Activity of the Stomach. We have long known that our test meals as usually given are far from being ideal methods of arriving at the true functional activity of the stomach.

Boas¹ points out the errors that may occur in the examination of the stomach according to the various methods proposed. Jaworski's method of administering the whites of one or two boiled eggs with 100 c.c. water is open to the objection that the elements of carbohydrate digestion are entirely wanting. Riegel's test dinner consists of a plate of beef soup, 150 to 200 gm. beefsteak, and 150 gm. puree of potatoes. This method is open to several objections: (1) The time for the evacuation of the gastric contents is variable as stated by Riegel himself; (2) there is too much variability in the articles of diet selected; (3) after about three hours the gastric contents in most cases will show the presence of sarcolactic acid, this being distinguishable from the lactic acid of digestion only by

¹ Berl. klin. Woch., Ewald Fest-Nummer, October 30, 1905.

the most laborious processes; (4) the occurrence of occult gastric hemorrhages cannot be demonstrated on account of the ingestion of blood in the beefsteak. The Ewald test breakfast has proved to be the simplest and most practical method of examining the gastric contents, but even this has source of error. The test breakfast is often modified, thus making it valueless for comparative purposes. According to the original directions the patient should take on an empty stomach a roll (about 35 gm.) with 400 gm. (15 ounces) water or tea without milk or sugar, the gastric contents being removed one hour later. In order to insure an empty stomach before the meal is taken the stomach tube should be used. If remnants of food remain in the stomach, both the hydrochloric acid and the lactic acid tests may be falsified. Any change in the composition of the test breakfast, or in the time at which it is removed from the stomach, will produce differences in the results of the quantitative tests. Another source of error lies in the fact that the test meal often is not given in the morning on a fasting stomach, but later in the day; this also destroys the value of the quantitative results.

It has been shown by Ewald, Hemmeter, and others that the quantity of hydrochloric acid secreted varies greatly in some individuals; a condition termed "heterochylia."¹ This condition may be found in organic disease of the stomach and frequently accompanies menstruation or pregnancy in women. It is, therefore, important that a diagnosis in gastric disease should not rest upon a single examination of the stomach contents, but should be made only after repeated investigations. In cases of atony error may be caused by the reactions of the contents of the fasting stomach. After washing out these contents, a test breakfast may show normal or increased hydrochloric acid secretion, whereas under ordinary conditions the secretion is diminished. In the same way the stagnation contents may give the lactic acid reaction while the test breakfast gives negative results. This source of error may be partly overcome by estimating quantitatively the enzymes (rennin and pepsin) in addition to the hydrochloric acid. It is a known fact that pathological lactic acid fermentation usually is accompanied by deficiency of enzymes.

False qualitative and especially quantitative results may be obtained from an admixture of abnormal constituents with the gastric contents, such as blood, bile, mucus, and saliva. Considerable error may also arise in the demonstration of gastrosuccorhea according to the method of Reichmann, Riegel, and others. This method consists in washing out the stomach in the evening and taking the gastric contents the next morning as representing an excess of gastric juice. It is evident, however, that these contents may consist of secretion plus water that remains from the previous evening's lavage.

¹ PROGRESSIVE MEDICINE, December, 1903.

It is very difficult to estimate the motor activity of the stomach by means of the test breakfast. The recovery of a large amount of gastric contents does not necessarily mean that there is deficient motility, as an excess of secretion may readily account for it. If there is a small residue with normal or increased hydrochloric acid we may conclude that the motor activity is normal. If the contents are of excessive quantity with deficient hydrochloric acid a conclusion of atony may be drawn. A number of methods for determining the gastric motility have been proposed, but in the author's opinion none can equal in practical value the old method of Leube. In the opinion of most authorities none of the newer methods have stood the test of time.

The Boas-Riegel meal, referred to above, was introduced to produce more stimulation of hydrochloric acid secretion than did the more simple Ewald breakfast. This lack of stimulation was subsequently proved by the work of Pawlow to be partly psychical and applies more particularly to American than to Continental stomachs. Rolls and tea are not calculated to excite the psychical secretion in stomachs not accustomed to a breakfast of bread and tea or coffee.

TEST BREAKFAST OR TEST MEAL? Dörner¹ has shown that the test meal is valuable in more ways than we thought. His paper is interesting and suggestive. He reports a series of cases in which both the test breakfast and the test dinner were given on successive days, or with but a few days' interval. The results show that on the whole the hydrochloric acid values are smaller after the dinner than after the breakfast. The explanation of this may be that the diseased stomach can produce enough hydrochloric acid for the smaller meal to allow of sufficient free acid remaining over; but the larger demands of the test dinner use up all of the free acid and produce a deficiency of hydrochloric acid. It is well known that atonic conditions of the stomach may produce indefinite symptoms for a long time. A test breakfast would probably show no variation from the normal, whereas a test dinner would reveal the deficiency. An apparent hypersecretion after the test breakfast may be dissipated and shown up in its true light by the heavier meal. On the other hand a true hyperacidity is often increased and made more evident by a test dinner.

According to these results it is not well to place all our faith upon the outcome of a test breakfast. It would seem better to start the examination of the patient with a larger meal. If the hydrochloric acid secretion proves sufficient for this the breakfast test is unnecessary. But if the dinner reveals a deficiency of hydrochloric acid, the degree of this insufficiency may often be determined by the administration of the smaller

¹ Münch. med. Woch., 1906, No. 10.

meal. For scientific purposes it would be better to employ both methods in every case.

The Purely Nervous Affections of the Gastrointestinal Tract. One of the most difficult problems that the student of gastrointestinal diseases is called upon to decide is to what degree a disturbance of sensation or even of function is purely nervous in origin. In the following article Boas¹ discusses those affections that appear purely nervous at least in the beginning, though, as he says, they may not remain so long, for they may by their persistence gradually lead to anatomical changes in these organs. Hence, the dividing line between purely nervous and purely somatic diseases is often not clearly drawn and only a careful comparative analysis of the subjective disturbances and functional tests of the gastrointestinal tract and nervous system will reveal the true nature of the disease. Boas divides gastrointestinal neuroses into two large groups—the monosymptomatic and the polysymptomatic.

GASTRIC NEUROSIS. The monosymptomatic neuroses of the stomach are characterized by the predominance of a single symptom which may be of a depressive or of an irritative character. To the group with depressive symptoms belong those cases characterized by anorexia, by a perverted feeling of satiety, or by a condition of pressure and fullness. Among the irritative neuroses may be included boulimia, painful sensation of an empty stomach, gastric burning, nervous cardialgia, rumination, regurgitation, nervous eructation, and nervous vomiting, nervous hyperchlorhydria, and nervous gastrosuccorhea. The diagnosis is usually made easy by the predominance of one symptom aided in obscure cases by the anamnesis, the course of the disease, and the functional tests of the stomach and nervous system. The anamnesis may reveal a neurotic tendency, a hereditary trait, previous diseases, etc. The important features in the course of the disease are (1) the periodic, intermittent, bizarre nature of the symptoms, and (2) the independence of the subjective phenomena from the quality and quantity of the diet. The functional tests of the stomach may reveal normal conditions of secretion and motility, but in some cases these may be abnormal. Examination of the nervous system will frequently show some abnormality of function.

The polysymptomatic neuroses of the stomach offer greater difficulties of diagnosis. Here the anamnesis gives an abundance of symptoms that is very seldom encountered in organic disease of the stomach. The objective examination is usually negative or may reveal conditions that are often misleading, namely, dislocation of one or both kidneys and splashing sound in the region of the stomach. Here, also, the course of the disease reveals a capriciousness altogether lacking in organic affec-

¹ Deut. med. Woch., 1905, No. 33.

tions, and the symptoms are altogether independent of the diet, as may be determined by varying the character of the food.

INTESTINAL NEUROSIS. The separation of intestinal from gastric neuroses is often merely theoretical, but it must be admitted that there are isolated neuroses of the intestines, as there are those of the stomach. Methods of examination are more difficult and uncertain in the case of the intestinal tract. Our knowledge of monosymptomatic intestinal neuroses is limited to two conditions, functional constipation and nervous diarrhea. The characteristic features of nervous constipation are its dependence upon psychic insults and the favorable influence of mental and physical rest. Nervous diarrhea is often very difficult to diagnose and even the character of the stools throws very little light upon it. The more important points of diagnosis are as follows: (1) Independence of the diarrhea from astringent diet and astringent drugs, even opium. (2) Dependence of the diarrhea upon psychic influences. (3) Occasional cessation of the diarrhea without cause. (4) Strikingly small loss of weight in spite of long continuance of the condition. (5) General neurasthenic stigmata.

In analogy with the polysymptomatic nervous dyspepsia there is a nervous enteropathy, the clinical picture of which has not yet been placed in a definite form on account of its heterogeneous manifestations. Typical cases are characterized by a feeling of pressure and fulness in the mesogastrium or hypogastrium, associated with periodically recurring enteralgia. There is frequently flatulence, but a careful physical examination reveals no evidence of meteorism. There are, however, more or less evident symptoms of general neurasthenia.

TREATMENT OF GASTROINTESTINAL NEUROSSES. In the treatment of these neuroses a change of environment is one of the most important measures to be adopted. The second indication is gradually to spur the fundamentally healthy but irritable organs to perform their maximal amount of work. Both of these indications are best met by removal to special institutions for the treatment of gastric or nervous diseases as the case may demand. Most of these cases are poorly nourished and an improvement of the nutrition is the first consideration. A modification of the Weir Mitchell rest cure often fills the requirements. Upon leaving the sanatorium, however, it must be impressed upon the patient that his cure is not yet completed. He must not return to business for several months, must continue his dietetic treatment, and must carefully regulate his rest and exercise. A weekly weighing should be instituted in order to determine whether or not he is losing ground.

In many cases sanatorium treatment is not possible nor is it always necessary. In such cases a change of air to the mountains or seashore, or a sea voyage, may be recommended. Hydrotherapy, electrotherapy,

massage, and gymnastics are often valuable adjuncts to treatment, but are too frequently employed promiscuously without proper regard for their special indications. Fashionable watering places are totally unsuited for the treatment of these neurasthenic cases. Drugs are to be avoided if possible; but in many cases the employment of the bromide preparations, the milder opium derivatives (codeine and diorin) and the modern valerian preparations (validol and valyl) may form a useful adjunct to hygienic and regulative treatment. As soon as possible, however, the doses of these drugs should be gradually diminished and omitted and the patient should be taught to rely upon the other more important measures.

Hydrotherapy in Diseases of the Stomach. Brieger¹ says that hydrotherapeutic measures are a valuable adjunct to diet and the stomach tube in the treatment of gastric diseases. Both general and local measures are of value. The general hydiatic procedures are to be considered when the gastric disturbances rest on a neurotic basis. In such cases short cold half-baths act well, preceded in excitable patients by wet packs. In those who have previously been subjected to hydrotherapy, cold rubs, sheet baths, and general douches may be used. Even in cases where the gastric disease is the primary one these general measures are valuable to overcome the psychic depression and produce a general tonic effect. At the same time the local symptoms are often much relieved. Of still greater value in the treatment of diseases of the stomach are various local hydriatic measures, such as the Preissnitz compress, the wet hot pack, poultices, and the thermophore, applied first on a wet compress. A procedure which should receive more use than it does is the Winternitz cold trunk compress with enclosed rubber coil, through which circulates hot water. This is especially useful in the cardialgia resulting from gastric ulcer. If hemorrhage occurs from the ulcer, cold water may replace the hot water in the coil. Winternitz's method is also useful in nervous vomiting, hyperemesis of pregnancy, anorexia of consumptives, and gastralgia. In gastric hemorrhage good results are obtained from the introduction of small pieces of ice into the rectum and the use of high enemas of ice-water. In the treatment of local pains, especially those of nervous origin, a useful procedure consists of cold linen compresses with dry covering, the Preissnitz abdominal binder. In atony and chronic catarrh of the stomach the fan douche is of value in increasing the motility. Sitz baths of various temperatures and duration are employed frequently in the treatment of intestinal diseases. The methodical drinking of cold spring water stimulates gastric and biliary secretion, as well as peristalsis; while hot alkaline waters are advised for hyperchlorhydria.

¹ Berl. klin. Woch., Ewald Fest-Nummer, October 30, 1905.

Hereditary Gastrosuccorhea. The pathogenesis of continuous hypersecretion is still obscure. There are certainly some cases, however, that are of pure neurogenic nature. Pickardt¹ reports three cases that undoubtedly belong to this class. They were under observation for many years and never presented the slightest evidence of a complication that would point to organic disease of the stomach.

A further peculiarity of these three cases was the close relationship existing between them, that of mother and two sons. All three patients began to complain about the same time; until a few months previously they had lived together, had eaten at the same table and had been subjected to the same influences. There were no evidences of a "nervous disposition" in any of them. The symptoms and course of the disease were typical in all three patients. The author believes that this is the first time that a hereditary tendency has been observed in gastrosuccorhea.

Gastromyxorrhea. L. Kuttner² says that the question of the secretion of larger amounts of mucus into the fasting, empty stomach, is one that has been much neglected by all authors. In his stomach examinations he has found this condition so often that he thinks it worthy of more attention. The characteristic feature consists in the secretion of large quantities of mucus when the stomach has not been subjected to digestive stimulation for some time. During the periods of digestion, however, the amount of mucus in the stomach may be very small.

Under normal conditions the fasting stomach contains at most a few cubic centimeters of mucus. Microscopically there are found cylindrical epithelial cells or thin nuclei, a few leukocytes or their nuclei, and at times Jaworski's spirals. The reaction may be acid, neutral, or alkaline; free hydrochloric acid may be present or absent; and the zymogens of the gastric mucous membrane are usually demonstrable even in the presence of an alkaline reaction. The author considers the presence of more than 5 c.c. of mucus to be pathological, but speaks of gastromyxorrhea only when the quantity exceeds 25 c.c. The recovery of 60 to 100 c.c. of mucus from the fasting stomach is not a rare event in this disease. As there are many sources of error in estimating the quantity of mucus in the stomach a hypersecretion can only be assumed if the finding is a constant one or if it always recurs at certain intervals.

In uncomplicated cases of gastromyxorrhea the secretion has the following characteristics: (1) It is grayish, cloudy, slimy, and tenacious, and contains hyaline-like bodies or mucous flakes; on standing it separates into two layers, a smaller, lower layer of mucous clumps and flakes, and an upper layer of cloudy fluid. (2) The reaction of the

¹ Berl. klin. Wochen., Ewald Fest-Nummer, October 30, 1905.

² Ibid.

secretion may be weakly acid, neutral or more frequently alkaline; hydrochloric and lactic acids are never found. (3) The pepsin, estimated by Mett's method, varied between 2 and 4 mg., being entirely absent in some cases. (4) The test for rhodanic combinations by the ferric chloride test was negative, as was also Trommer's test; the biuret test was positive; and Gmelin's reaction was at times positive but often negative. (5) No gas formation was observed after the addition of grape sugar. (6) Blood tests were usually negative. (7) The specific gravity of the fluid was 1003 to 1010. (8) The freezing point varied between 0.29° and 44.0° . (9) Microscopic examination showed leukocytes and their nuclei, rarely cellular elements from the gastric mucosa, occasionally isolated yeast cells and micro-organisms.

The most important variation from this typical description arises from the association of gastrosuccorhea with gastromyorrhea, in which case, a certain amount of hydrochloric acid will be found in the secretion. If marked motor insufficiency exists the secretion will also contain food remnants.

The clinical picture of gastromyorrhea may assume two forms, an intermittent and a chronic form. The intermittent variety is quite rare and is characterized by the occurrence of increased mucous secretion in paroxysms. The attack begins suddenly, or may be preceded by prodromes (headache, anorexia, nausea, etc.). The most prominent symptom of the attack is violent vomiting, which is absolutely unaffected by any attempts to stop it. The vomited matter consists first of large quantities of mucus, with which later are mixed bile and duodenal secretion. Pain is usually absent altogether. Nothing can be retained on the stomach. Marked loss of strength results, the abdomen is retracted, the pulse is small, the tongue becomes dry, and urine is scanty. The attack usually lasts one day, but may be prolonged to three to five, or even twelve days. It ends suddenly and the patient feels perfectly well between attacks. This condition seems closely allied to the gastric crises of locomotor ataxia and to Leyden's periodic vomiting. In two of the author's cases the gastric attack was immediately preceded by a marked increase in secretion from the nose, a rhinorrhea. Whether the latter condition offered the stimulation to the increase of secretion in the stomach, or whether both conditions rested upon a common etiological basis, is undecided.

The more frequent chronic form of gastromyorrhea is often unaccompanied by any subjective symptoms. In many cases there is an underlying condition of the stomach which gives rise to symptoms. Such condition may be a chronic catarrh, a neurosis of the stomach, or a chronic gastric ulcer with or without pyloric stenosis.

No positive assertion can yet be made concerning the significance and

origin of the mucus. Attempts have been made to differentiate the mucus secreted by various parts of the stomach. That from the pyloric end is supposed to have certain characteristics; while differences have been found between the mucus of the "true gastric mucous glands" and that secreted by the surface epithelium. Kuttner thinks that he could demonstrate in some of his cases that the mucus came exclusively from the pyloric mucous membrane.

Anatomical investigations are still wanting in gastromyorrhea; hence, the pathology of the condition is still unknown. It is probably of nervous origin like the condition of gastrosuccorrhea. It may be compared in many ways to mucous colitis.

The diagnosis of gastromyorrhea rests upon the finding of large quantities of mucus in the empty stomach. It is necessary, however, to be sure that the mucus is secreted in the stomach and does not come from the nose, mouth, pharynx, bronchi, or esophagus. The presence of other symptoms is not necessary for diagnostic purposes. It is best to obtain the gastric contents in the morning after ten to twelve hours' fasting. If stagnation exists, it is well to wash out the stomach on the preceding evening.

THE TREATMENT OF GASTROMYORRHEA. In the treatment of the intermittent form the attack is best met with lavage. Drugs are of no use, except, perhaps, the subcutaneous administration of morphine and atropine. Collapse must be treated by the injection of diffusible stimulants and hypodermoclysis. In the intervals treatment should be directed against the underlying nervous condition, employing hydrotherapy, massage, electricity, iron and arsenic, change of air and climate. If a definite cause can be determined, such as nasal disease or gastric catarrh, this cause must be remedied. In the treatment of chronic gastromyorrhea the underlying disease requires first attention. The accumulation of mucus may be removed by lavage, or by the use of mineral waters, the latter being usually a poor substitute for the stomach tube.

Physiological Stigmata of Bodily Degeneration (*Achylia Gastrica* and *Orthostatic Albuminuria*). The somatic stigmata of bodily degeneration have long been recognized in anthropology, but have received little attention in clinical medicine. Those opposite conditions, the phthisical habit and the apoplectic habit, are well recognized; but it is only recently that they have been regarded as representing congenital deficiency in the structure and development of the whole organism rather than symptoms of mere local disease. In these days of physiological investigations it seems quite natural to seek for functional disturbances that might be the expression of such congenital deterioration. In psychiatry we have evidences of these investigations, but none have been made in the case of other organs than the brain.

Albu¹ thinks that more attention should be paid to this aspect of "pathological physiology," a search being made for anomalies and their relation to the entire organism. The subjects of these physiological stigmata are usually considered to be normal and healthy until some accidental occurrence upsets their bodily poise. Some of these individuals, however, are never in the full possession of health, but are half-invalids their whole lives through.

The constitutional anomalies formerly embraced only the diseases of metabolism, but the investigations of Martius and others have added to the list constitutional gastric deficiency, constitutional cardiac weakness, constitutional albuminuria, constitutional weakness of the blood-forming organs (chlorosis) and the vessels (arteriosclerosis). A careful investigation of these cases will show that hereditary predisposition plays an important part in their etiology. The patient's ancestry may show distinct evidence of an anomaly in metabolism, blood formation, nervous system, or other organ; or, on the other hand, there may have been only an irritable weakness of the nervous system, a "neurasthenic disposition." In the inheritance of such predispositions the disease tendency may appear in the special form of a localized disturbance of innervation, concentrated upon a single organ, manifesting itself as a diminution in the functional capacity of that organ.

To illustrate his point the author takes up the question of achylia gastrica and orthostatic albuminuria. In the former case he has reference only to the simple form of achylia without atrophy of the glands, a symptom complex that Einhorn has attributed to pure nervous influences. Patients with this condition may go for years without any symptoms, the intestines assuming completely the digestive functions of the stomach. The author believes that this anomaly is a sign of congenital loss of an organic function through deficient innervation, the disposition to which is inherited from a functional degeneration of the nervous system in the patient's ancestry. He cites one of his cases of achylia gastrica in which an examination of the patient's brother also revealed the same condition of the stomach. Both brothers were poorly developed physically, and the second one was a pronounced neurasthenic. Their mother was markedly hysterical, with visceroptosis (especially gastropptosis) and mild atony of the stomach; the examination of her gastric contents showed hyperchlorhydria.

The author also reports a case of orthostatic albuminuria in a girl, whose parents were blood relations, and of a family in which diabetes, obesity, gout, neurasthenia, and insanity had all repeatedly shown themselves. None of the four children of these parents were entirely healthy.

The patient herself showed little, if any, improvement under prolonged treatment. The pathogenesis of orthostatic albuminuria is still under discussion; but this case would indicate that such a functional disturbance of the kidneys probably rests upon the basis of a congenital pathological tendency. From analogy with achylia gastrica the conclusion might be drawn that a deficiency of innervation also is responsible for orthostatic albuminuria. Many of these cases go over into chronic nephritis, just as achylia gastrica may turn into chronic gastritis, owing to the action of irritants upon a congenitally weak organ. In conclusion it is suggested that hemophilia is also in all probability a local physiological stigma of inherited degenerative tendencies.

Tuberculous Ulcer of the Stomach. Alexander¹ reports an instance of this rare condition. The patient was a man of forty years who had been complaining for nine months of gradual loss of appetite, pains in the epigastrium about three-quarters of an hour after eating, water-brash, but no vomiting. There was loss of weight and progressive weakness. The gastric contents, removed the morning following a test supper, consisted of 50 c.c. of a coffee-like residue. It gave the reaction for lactic acid and occult blood, and contained muscle fiber, starch, lactic acid bacilli and sprouting yeast. An operation was decided upon, and upon opening the abdomen a slight thickening of the pylorus was found, with a few small nodules on the serosa resembling metastases. The pylorus was resected and was found to be the seat of an annular, flat ulcer with infiltration of the mucous membrane. Microscopic examination revealed a chronic inflammatory granulation tumor of the gastric wall, probably tuberculous in nature, although no tubercle bacilli were found. The patient died eighteen days after the operation, and at autopsy no other tuberculous lesion could be found in any part of the body. Three other cases of pyloric tuberculosis have previously been reported, and in all four cases the diagnosis *in vivo* has been carcinoma of the pylorus. In these cases also the lesion of the stomach was the primary one.

The Treatment of Gastrointestinal Hemorrhage. Probably the best means of stopping gastric hemorrhage is by the application of extreme cold or extreme heat. This is best done by lavage with cold or hot water. Ewald favors the use of ice-water which is continued until the wash-water ceases to show blood. There is no reason to fear injury to an ulcer by the introduction of the tube if this is done properly. It is inserted so that the end just enters the cardia, then as the stomach is distended with ice-water it can be passed farther down. The lavage can be repeated as often as needed. In cases of bad hemorrhage it is best to give a small injection of morphine to allay restlessness and prevent vomiting. Ewald treats

¹ Deut. Archiv. f. klin. Med., 1906, Band lxxxvi, Nos. 1 and 3, p. 212.

collapse with injections of ether, enemas of whiskey or coffee, and external heat to the extremities. If the loss of blood is very excessive, so that the pulse becomes very small, a hemic murmur develops over the base of the heart and there are symptoms of cerebral anemia. Salt solution should be given subcutaneously.

Rodman uses hot water instead of cold, employed by lavage in much the same manner. He reports one case in which gastric hemorrhage was successfully checked after it had recurred repeatedly and a gastroenterostomy had failed to check it.

Many different medicinal remedies have been employed with results that vary much and lead one to suspect that none of them are very efficient, and that the bleeding stopped from natural causes and not from drugs in the cases reported.

Thus Ewald has used stypticin, styptol, adrenalin, and gelatin. The latter he has given by the mouth, by the rectum, and subcutaneously. He has seen no definite result from any of them.

The Indications for Operation in Gastric Hemorrhage. The opinion at the present time of those best qualified to judge is distinctly against operation for uncomplicated acute gastric hemorrhage. It seems well established that gastroenterostomy alone will not stop acute hemorrhage. If operation is to be of any service the bleeding point must be found and either excised or so folded in that all danger of further bleeding is eliminated. This is a most difficult thing to do. As Ewald says, it is often excessively hard to find the point of bleeding even at autopsy, to say nothing of operation. Besides, the medical treatment is usually successful. Von Leube puts the mortality from uncontrollable gastric ulcer at 1 per cent. of cases of gastric hemorrhage. Ewald has yet to see his second fatal case from hemorrhage alone. The mortality from operated cases is certainly much higher, though it is hardly fair to the surgeons to quote figures, since the surgery of gastric ulcer is developing so fast and so steadily that the figures of past years are misleading. Still, as Ewald says, the question whether operation is needed or not must be settled afresh in each case. What I have said must be distinctly understood as applying only to uncomplicated and acute visible hemorrhage from gastric ulcer. It is probably the most unfavorable field for gastric surgery. After the hemorrhage is controlled, and especially if it runs a chronic course, with a tendency to recurrence, then operation in the interval between hemorrhages may be strongly indicated. What I mean to say is that surgical opinion at present is against interference during the period of acute hemorrhage.

Boas is one of several who advocate the use of calcium chloride. He gives it generally by rectum, 60 grains at a time. He says it is very difficult to tell whether it has ever had any definite effect. Theoretically

calcium should help increase the coagulability of the blood and is a rational remedy to use. Personally, I have often given it especially in cholemic hemorrhage and in hemoptysis, but I have never been convinced that it had much effect. However, it is apparently harmless and we feel like letting no chance escape us in such cases. I have great confidence in the local application of cold in hemorrhage and shall try Ewald's method of ice-water lavage with much interest. I have already used the external application of cold as a routine measure in gastric hemorrhage.

As Ewald says, it is extraordinary how rapidly the blood regenerates in these cases of great loss of blood. He reports the case of a girl who rapidly fell to 2,100,000 red cells from hematemeses and fourteen days later had risen to 3,560,000.

The Distinction between Hemorrhage from the Stomach and Lung. As Ewald¹ remarks, it is not always easy to distinguish the source of blood in bleeding from the mouth. It is often hard to say whether the blood is coughed up or vomited. The common idea is that blood from the lung is bright red and that from the stomach is dark and partially digested, so that it has the appearance of coffee-grounds. This has many exceptions, however. Thus, when bleeding occurs in a stomach free from hydrochloric acid, and especially if vomiting occurs quickly, the blood is bright red. On the other hand, the blood may lie in a cavity in the lung or in a dilated bronchus until it is changed into a coffee-ground appearance.

In the great majority of cases the history and the course of the disease will indicate the origin of the hemorrhage. The problem becomes much more difficult if the bleeding occurs in the esophagus and the blood is first swallowed and then vomited, or if it is present only in traces as occult blood. In such cases evidence of portal obstruction and the detection of a bleeding point by the esophagoscope will help in the diagnosis.

The idea also prevails that we can tell from what portion of the bowel blood comes by its appearance in the stool, and that dark tarry blood means hemorrhage high up, while clots and red blood come from the rectum or large bowel. While as a general rule this is so, still if peristalsis is increased blood may be swept down from the stomach or duodenum so rapidly as to appear red and comparatively unaltered.

Occult Bleeding in Typhoid Fever. In *PROGRESSIVE MEDICINE*, December, 1905, I referred to investigations upon the stools of typhoid fever patients for the purpose of determining whether they contained occult blood with any degree of regularity. I quoted a paper by Petrachi and one by myself. During the past year papers upon this subject have appeared by Romani,² Tileston,³ and myself.⁴

¹ Berl. klin. Woch., 1906, No. 9, p. 258.

² Riforma Medica, Feb. 3, 1906.

³ Boston Med. and Surg. Jour., July 12, 1906.

⁴ Univ. of Penna. Med. Bull., July, 1906.

During the past winter I have studied thirty additional cases more or less systematically. As in my first series, the tests were always made in the febrile period of the disease. The results of my second series of observations were strikingly different from my first and showed a much larger percentage of positive occult blood tests. I combined the two series and reported the results of two hundred and thirty-nine observations upon forty-nine cases.

The tests were made with due regard to the presence of hemorrhoids, of swallowed blood, and of the use of beef-juice as a food. To obtain reliable information the examination should be systematic and should be made upon every stool.

The method used was the guaiac-peroxide and aloin-turpentine tests made upon an acetic acid ethereal extract of the stool. The technique was given in full in *PROGRESSIVE MEDICINE*, December, 1905.

I found occult bleeding thirty-two times in two hundred and thirty-nine stools tested in the forty-nine cases. The number of patients showing positive tests was fifteen (29.5 per cent.) of the total forty-nine cases. Occult bleeding occurring within three days after a visible hemorrhage was not tabulated, for the blood from the visible hemorrhage would probably not leave the gastrointestinal tract in less than three days.

The percentage of positive cases in the combined series is much larger than in my first series and probably gives a more correct idea of the frequency of occult bleeding in typhoid. My percentage is slightly lower than that given by Petrachi or Romani and slightly higher than Tileston's.

Petrachi found occult bleeding in 44 per cent. of eighteen cases.¹ Romani published the results of a series of observations in which he found occult bleeding in 32 per cent. of fifty cases. Tileston obtained positive results in about 25 per cent. of sixty-eight cases.

Most of my tests were made in the second, third, and fourth weeks of the disease, and the greatest number of positive results were obtained in the third week. Tileston found blood most frequently in the fourth week.

The proportion of positive tests in relapses was greater than in the primary attack although the number of observations is too small to be conclusive.

In my series, occult bleeding occurred quite as often in mild as in severe cases and, as has been said, is very likely to take place during a relapse. My observations, therefore, do not agree with those of Petrachi, who says that the occurrence of bleeding varied directly with the severity of the attack.

Romani, however, found, as I did, that the occult bleeding occurs quite as often in mild cases as in severe ones.

¹ *PROGRESSIVE MEDICINE*, December, 1905.

The following table shows the severity and the proportion of occult hemorrhages:

	Cases.	Positive.
Mild	13	5
Moderate	20	2
Severe	13	6
Relapses	2	2

In judging the severity of the attack, the amount of toxemia and the duration of the fever were taken into consideration. Probably no correct idea of the frequency or causes of occult bleeding in typhoid fever will be obtained until many series of observations are compared from hospitals which have all sorts of cases and where different varieties of treatment are in force.

The cases at the Presbyterian Hospital, Philadelphia, where my work is done, as a rule come from a comparatively prosperous class of mechanics who enter the hospital fairly early in the course of the disease. The treatment consists of a minimum of drugs, baths or sponges for the fever, and a liquid or very soft diet. The typhoid mortality for the last ten years, including moribund cases, is 12.2 per cent. It would be interesting to know what the frequency of occult bleeding is in hospitals where the patients come from the poorest classes and when the disease is neglected and allowed to run a good part of its course before admission.

Tileston, with a mortality of 7 per cent., found 25 per cent. positive, while Petrachi's whole mortality was 17 per cent., found blood in 44 per cent. This might indicate that after all the severity of the case influenced the frequency of bleeding, and I imagine that in the long run this will be discovered to be the truth.

Statistics of typhoid fever epidemics are notoriously misleading and hard to interpret.

The practical usefulness of the detection of occult bleeding in typhoid would seem to lie in the possibility of foretelling visible hemorrhage by occult bleeding. In my experience occult bleeding does not precede visible hemorrhage with sufficient regularity to make the test of much practical value. On the other hand, visible hemorrhage does not always follow occult bleeding. In a general way, however, it may be said that those cases that show a tendency to occult bleeding are the ones in which visible hemorrhage is most likely to occur.

Among the fifteen cases in my series with occult bleeding, six had visible hemorrhage. On the other hand, in the ten cases with visible hemorrhage, four cases did not show occult bleeding except directly after the visible bleeding. Tileston found that the test was of no value in predicting hemorrhage. Both Petrachi and Romani claim that their observations showed that occult bleeding always preceded visible

hemorrhage by from one to five days, and by this means it is possible to prophesy serious hemorrhage. However, neither says how often in their experience occult bleeding was not followed by hemorrhage.

Upon the whole it may be said that occult bleeding is not as common in typhoid fever as might be expected. The typhoid ulcers seem to show less tendency to bleed than do other ulcers of the gastrointestinal tract, and this is an interesting side light upon the pathology of the disease.

Thus far one cannot hope for much aid in diagnosis or conduct of the treatment by the systematic examination of the stools for occult blood.

Lactic Acid and Long Bacilli in Cancer of the Stomach. In PROGRESSIVE MEDICINE, December, 1904 and 1905, I referred to recent work upon the significance of the long bacilli (or Oppler-Boas bacilli) in the diagnosis of gastric carcinoma. It has long been known that these organisms bore some relation to the lactic acid of the gastric contents and are present in almost all cases of ulcerated gastric cancer, but their exact significance has been obscure.

Sick, writing from Romberg's clinic,¹ summarizes from a series of observations the clinical importance of the bacilli as follows: They are hardly ever absent in cases of ulcerated gastric carcinoma, and can exist even in the presence of small amounts of free hydrochloric acid. Their presence is of no value in the early diagnosis of cancer because they can also be found in cases that are not cancerous, provided that the hydrochloric acid secretion is low or absent. Another condition that favors their growth is motor insufficiency. They can also be found in the mouth of normal individuals. The presence of long bacilli are of diagnostic value only when a decided amount of lactic acid is also present.

Sick has undertaken a series of experiments to determine why the long bacilli can be present in the gastrointestinal tract in non-cancerous cases without the formation of lactic acid, while in cases of cancer large amounts of lactic acid is invariably present.

He finds that certain albumins must be present before these bacilli can form acids. If small amounts of soluble albumins are present, various fatty acids are found and only a very little lactic acid. If, however, extracts of cancer or of a tissue rich in cells (like the thymus) is added lactic acid formation is intense and rapid. It may be that the albumins in the stomach upon which the bacilli work in lactic acid formation are the soluble albumins that have been thrown off from the cancer as a result of autolysis. As I have said, the growth of the bacteria and the formation of lactic acid is favored by stagnation of the gastric contents and low and absent hydrochloric acid. The presence of fatty acids, such as butyric, has no significance in the presence of long bacilli, since such acids can be formed in the presence of any soluble albumin.

¹ Deut. Archiv. f. klin. Med., 1906, Band lxxxvi, p. 370.

The clinical lesson for us in this work of Sick is that the combination of good amounts of lactic acid with large numbers of long bacilli is a very strong indication of advanced gastric cancer. Long bacilli without lactic acid even when fatty acids are present are not of diagnostic value. The presence of the bacilli, however, is not a reliable sign in early stages of cancer because before the stage of ulceration of the tumor, lactic acid formation is insignificant and the bacilli can be present in non-cancerous cases when the hydrochloric acid is low, and especially if there is gastric motor insufficiency.

CANCER OF STOMACH WITH METASTASES IN CRANIUM AND MENINGES. Pinatelle and Cavaillon¹ describe two cases of gastric cancer with secondary deposits in the cranial bones and meninges, and have been unable to find any reported cases of cancer of the stomach associated with secondary deposits in these parts. The first case was that of a man, aged forty-five years, who had suffered from gastric cancer for upward of a year. A short time before he died a small hard tumor developed at the upper border of the right orbit. Postmortem, the pylorus was involved in a growth, the stomach was dilated, and there was extensive glandular enlargement both of the glands of the lesser and greater curvatures of the stomach and of the retroperitoneal glands. Numerous secondary deposits were present in the liver. At the base of the brain, on a level with the anterior clinoid process, was a lump the size of a walnut which protruded upward and caused a depression on the under surface of the frontal lobe; on incising the dura mater covering it this lump was found to extend to the orbit on a level with the optic nerve, and was here adherent to the bone. A piece of this tumor examined microscopically exhibited the characters of a cylinder-celled carcinoma. The second case was that of a man, aged thirty-four years, in whom a tumor in the epigastrium was discovered accidentally. On postmortem examination there was found a tumor of the stomach involving the omentum, together with some enlarged lymphatic glands. On the internal surface of the cranial vault in the posterior part of the left parietal fossa was a soft violet-colored, villous growth the size of a five-franc piece. On the internal surface of the dura mater covering this tumor there were found numerous small granulations similar in appearance to the large villous tumor, and in this region the meninges were found to be thickened. The brain was healthy. Microscopically the cranial tumor proved to be a carcinoma. Both these patients shortly before death developed symptoms resembling delirium tremens, and the second also developed bilateral ptosis.

The Stomach in Pulmonary Tuberculosis. The association of dyspeptic symptoms with pulmonary tuberculosis is common and well recognized.

¹ Prov. Med., April 14, 1906; and Brit. Med. Jour., Epitome, 1906, ii, No. 17.

The disturbance sometimes takes the form of a suppression of secretion, sometimes of a hyperesthesia, and very often of an irritable stomach with a tendency to vomiting. Various explanations have been offered for these symptoms. They are usually regarded, I think, as an expression of the general toxemia of the disease.

Pathological studies of the stomach in tuberculosis have not been frequent, and, therefore, we welcome such a series of observations as that of K. Faber.¹ He reports five cases from both a clinical and pathological standpoint. The stomachs were fixed directly after death by injections of 10 per cent. formalin solution through the abdominal wall. The first two patients were severe febrile cases in the terminal stages of the disease. The lesions found were a chronic gastritis with atrophy of the glands and infiltration of the gastric mucous membrane. The other three cases were incipient and afebrile in type with very few physical signs in the lungs. Here the gastric symptoms clearly antedated those of the lung. The lesion was an infiltration of the gastric mucous membrane, in one case approaching a follicular gastritis.

Faber adopts the toxemia theory as the explanation of the gastritis, and suggests that it is the attempt to excrete the toxin through the gastric wall that causes the irritation.

Palier² has studied a number of cases of pulmonary tuberculosis with gastric symptoms. Most of his patients were men between the ages of twenty-two and forty-five. His observations showed that in about 60 per cent. there was a high grade of acidity; in 20 per cent. the stomach secretion was of the middle grade, and in about 20 per cent. the secretion was lowered. The diet, therefore, should be determined by a study of the gastric condition in such patients. The effect of gastric secretion upon the tubercle bacilli of swallowed sputum was also studied. Gastric juice containing a moderate amount of acid is bacteriolytic to the bacilli, but very slowly so *in vitro*. Consequently, in lowered secretion there is a good chance of the bacilli escaping into the intestine in a virulent condition unless there is some vital process at work that is not present in experiments outside the body. A high acid secretion would be protective.

Palier suggests that the frequency of a high acidity might explain the frequency of gastric ulcer in tuberculosis. This view is opposed by the investigations of Francine, who finds that evidence of ulcer is not relatively frequent in tuberculous patients coming to autopsy at either the Philadelphia Hospital or the Phipps Institute.

A New Method of Testing the Functions of the Digestive Apparatus. Einhorn³ has devised a new method of determining the activity of the

¹ Berl. klin. Woch., Ewald Fest-Nummer, October 30, 1905, p. 61.

² Medical Record, November 11, 1905.

³ Ibid, February 10, 1906.

digestive secretions. It consists of a form of test diet, but instead of giving the patient a full diet, Einhorn passes small pieces of different foodstuffs through the digestive tract and marks each with a bead. The method is ingenious, and since it has the approval of so conservative and careful an observer as Dr. Einhorn, deserves our full consideration and a satisfactory trial. This I have not had the opportunity of making. As Einhorn says, it is much simpler and easier to apply than the Schmidt diet. I may refer to a point in which the method seems to me to be inferior to the Schmidt diet. The longer I work with the latter, and I have been using it constantly now for over a year, the more I am impressed by the fact that to get an accurate idea of what is going on in the intestinal tract the whole stool should be examined. For fecal matter is far from being homogeneous, and abnormalities may be discovered in one portion of a stool and not be found in another. Indeed, I am in the habit of regularly sieving out a stool after I have examined different parts of it microscopically. In this way one comes at a much better idea of the possible occurrence of connective tissue, meat fiber, mucus, potato cells, and detritus.

It is this general idea of each stool that we might fail to get in Einhorn's method even if it was frequently repeated. However, I have too much respect for his opinion to criticise him without very good data upon which to work.

About two years ago Einhorn described a method of estimating the motor functions of the digestive apparatus. It consisted in having the patient swallow a number of small porcelain or glass beads, which are later looked for in the feces. The time elapsed between taking them and the reappearance of the first beads indicates the length of their sojourn in the digestive apparatus. He tried at that time to coat these beads with substances which are digested in the stomach or bowels, in order to be able to judge the functions of the various parts of the digestive apparatus. This idea, however, was not feasible, on account of the difficulty of preparing the test beads.

At the beginning of this year he conceived the plan of attaching solid foodstuffs to glass or porcelain beads (by drawing them through the opening in the bead and tying them on with a silk thread) and then to have them pass through the stomach and bowel in order to see finally what remained attached to the bead.

Physiological. Einhorn tried at first to find out how various foodstuffs behaved in the stomach and bowel of apparently healthy persons. For testing the work of the entire digestive tract it was only necessary to have the beads with the food attachments traverse it and then examine them.

To test the work of the stomach only, the beads with the food substances

attached are tied to a long silk thread, placed in a gelatin capsule, the thread being drawn through the capsule, and then swallowed. The thread was passed into the stomach only for a distance of 50 to 60 cm. from the lips, and then the foodstuffs were exposed for from four to six hours to the action of the gastric juice. At the end of this time the beads were again drawn up by the silk thread and carefully examined. In this way the extent of the gastric digestion could easily be estimated. Both methods combined (stomach thread test and plain bead test) enable us to judge of the digestion in the stomach as well as in the bowel.

Experiments in healthy people show that both catgut and fish-bones are digested in the stomach, whereas boiled or raw meat (beef), raw chicken skin, and raw as well as boiled potatoes do not disappear altogether in this organ. The muscles show a swelling and loosening of the fibers. Raw muscle fiber and chicken skin disappear in the intestines; tendons, however, remain undigested. Raw potatoes show a varying condition, sometimes disappearing entirely, sometimes going through unchanged; boiled potato usually seems to be digested in the bowel, whereas the skin of potato (either raw or boiled) always reappears unchanged.

Fats with a very high melting point, as lard, stearic acid, wax, paraffin, are not absorbed in the intestine; suet and mutton-fat are digested in the bowel.

Experiments made with mutton-fat show that it remains unchanged in the stomach. Einhorn also tried to determine whether the disappearance of the mutton-fat in the intestines was a purely chemical process or a mechanical one, produced by the epithelium of the intestine. For this purpose he experimented with mutton-fat surrounded by gauze. It is evident that mechanical processes are excluded in this manner, whereas the chemical action remains. All the mutton-fat enclosed in the gauze disappeared. This proves that chemical processes plays the principal part in the absorption of mutton-fat, which has a melting point of 50 degrees Celsius. Thymus gland and potato were subjected to the same experiment. Here also it was shown that digestion was not interfered with by the gauze envelope.

Pathological. The behavior of the substances just enumerated in normal digestion being known, they can be employed for testing the digestion in disease.

CATGUT AS AN INDICATOR OF GASTRIC FUNCTION. First a few tests were made with catgut beads. It has been supposed for some time, through the investigations of Ogata and Schmidt, that connective tissue is not digested in the intestines but in the stomach. Therefore, connective tissue fibers are found unchanged in the stool when the stomach functions are disturbed (achylia gastrica). Catgut consists principally of connec-

tive tissue and ought to behave like the latter. This fact induced Sahli to employ the catgut in a new stomach test called the "desmoid test."

FALLACIES OF THE DESMOID TEST. In the course of further investigation Einhorn¹ has proved quite conclusively that catgut is sometimes digested in the intestines. In four cases in which there was a complete absence of gastric juice the desmoid reaction was positive,² that is the catgut was digested in patients who had no gastric digestion. This shows it must have been digested in the intestine. Einhorn examined the gastric contents by the tube the same day upon which the desmoid reaction was tried in order to show definitely that there was no gastric secretion and found it was always absent. In order to further eliminate the possibility of error, for the gastric glands might still have power of secreting and yet not respond to a test meal, Einhorn coated a catgut bead in hardened mutton-fat and gave it to a patient. Mutton-fat is not digested in the stomach, and yet the bead came through without the catgut. That is, the catgut must have been digested in the bowel.

Sahli himself has been led to think that some error might be attached to the method, for he says: "On the one hand we have cases in which the test breakfast shows a lack of free hydrochloric acid and yet the digestion appears to be sufficient according to the desmoid test; on the other hand, there are cases in which the digestion appears to be insufficient with the desmoid test, although after the test breakfast free hydrochloric acid is found. I naturally thought at first that the desmoid test had some inherent fault. I was unable to discover it, however, and came to the conclusion that, on the contrary, these differences and apparent contradictions furnish a plain illustration of the value of the method and the defectiveness of previous procedures."

Sahli thinks that after a test dinner there is sufficient gastric juice even when the test breakfast shows an absence of free hydrochloric acid. In order, however, to controvert even this objection of Sahli's, Einhorn made the following experiment: Five hours after the patient had taken the methylene blue desmoid bag and three hours after a larger meal the stomach contents were again examined. There was an entire absence of gastric juice and no blue coloration of the stomach contents, although the urine voided shortly afterward was blue. In this case the reaction must have occurred in the bowel; otherwise the urine would not have been colored.

Alexander and Schlesinger³ have arrived at the same conclusions in

¹ Jour. Amer. Med. Assoc., May 12, 1906.

² PROGRESSIVE MEDICINE, December, 1905.

³ Deut. med. Woch., May 31, 1906.

regard to the value of the desmoid test. They have subjected the reaction to the following tests: (1) They gave the bag to the same patients on different occasions; (2) they gave bags filled with different quantities of substances; (3) they gave bags filled with varying quantities at different times; (4) they tested the results in patients with gastric fistulae; and (5) they employed control experiments with picrocarmine. Besides this they tried certain experiments with the catgut and the bags *in vitro*. Their observations showed that the desmoid reaction gave very varying results in the same stomach under the same circumstances. In two cases, in which the activity of the gastric mucous membrane was approximately normal, they found that the carmine test showed coloration after one and a half and one and a quarter hours, while the chemical substances failed to appear either in the urine or in the saliva. In one case methylene blue appeared after two and a half hours, while iodine only appeared after eighteen to twenty hours. Even in some cases of hyperacidity the blue was excreted, while the iodine or salicylic acid was not found. With regard to cases of subacidity and anacidity, they found at times that, while there was no attempt at digestion of the trial breakfast, methylene blue appeared in the urine after a few hours (for example, three hours). Watching the change in the stomach of patients with gastric fistulae, they found that in the absence of all free hydrochloric acid both fibrin and catgut could be digested, and that a bag containing methylene blue, tied up with catgut, given in such a case stained the stomach contents blue after one and a half hours in spite of the complete absence of free HCl. The attempt to explain this by experiment *in vitro* failed, since it was found that artificially lactic acid was incapable of replacing HCl. But HCl with trypsin was able to digest the catgut. These irregularities of the reaction led to fallacies which render the test of no value. They conclude that one is not justified in trusting to the desmoid reaction alone in determining the functional activity of the gastric glands.

The work of Einhorn and of Alexander and Schlesinger goes far to show that we are probably wrong when we assume because of certain experiments *in vitro* that there is a specific relation between the digestion of certain tissues and certain digestive secretions. No test based upon this principle has stood the test of time and practical experience. This applies to the salol test, to the desmoid test, to the glutoid capsule test for pancreatic activity, to the muscle-nucleus test of Schmidt for the presence or absence of the pancreas, to the significance of muscle fiber in the stool as an indication of pancreatic disease; and to connective tissue in the stool as a sign of gastric insufficiency. The relations of the digestive secretions to each other are too intimate and complicated to warrant the hope that we can develop any test of their activity by

assuming that there is a specific relation between any one ferment and a particular food substance.

FISH-BONES AS AN INDICATOR OF GASTRIC FUNCTION. Since catgut, therefore, cannot be utilized as a positive indicator of the presence of gastric juice Einhorn employed fish-bones for the same purpose.

Faber was the first to call attention to the fact that in patients with achylia gastrica fish-bones reappear in the stool. Einhorn, therefore, made various experiments with fish-bones. First, he was able to experimentally prove that fish-bones placed in gastric juice in a test tube and kept at body temperature dissolve easily. Fish-bones were also digested in the stomach of healthy persons as shown above. The question now was, whether fish-bones could be digested in the intestine or not.

To decide this question Einhorn tied fish-bones into the lumen of the beads and surrounded them with a heavy coating of mutton-fat. This he gave to persons in whom previously the test with plain fish-bone had been positive. In the small intestine the fat disappears and the fish-bone is exposed to the action of the pancreas and intestinal secretion. If it, therefore, reappears intact in the stool, it shows that fish-bones are not acted upon in the intestine. The experiments with fish-bones and mutton-fat coating, which were several times executed, always gave the same result, viz., a reappearance of the fish-bones in the stool.

We can, therefore, conclude from a positive result of the fish-bone test that gastric juice must be present. We are not allowed to conclude from a negative result that gastric secretion must be absent. It is evident that the fish-bone requires a certain amount of time for digestion, and that if it leaves the stomach before this time the fish-bone will proceed through the intestinal tract unchanged. This will be evident from the later tests, and it really occurs off and on.

TESTING THE INTESTINAL FUNCTIONS. All substances enumerated which are little changed or not at all in the stomach and are entirely digested in the bowel may be utilized in testing the intestinal functions.

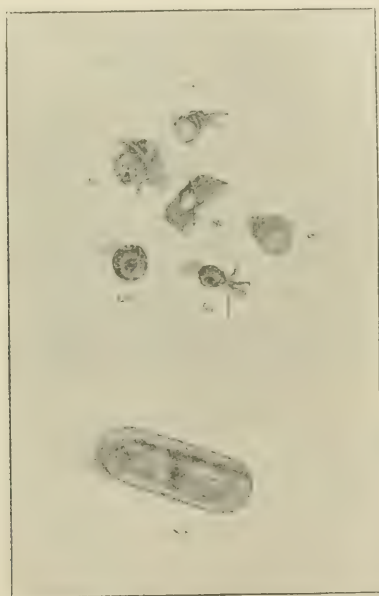
For albumin, we can use raw meat; for starch, potato (boiled two minutes); for fat digestion, mutton-fat. If the intestinal functions are good or normal, all these substances will disappear from the beads during their passage through the digestive tract; if there are, however, disturbances, we can recognize them from the reappearance of food substances attached to the beads. In connection with the intestinal function the pancreatic function may be tested by a piece of raw thymus surrounded with gauze and with bead attached.

With intestinal and pancreatic function intact the thymus will entirely disappear; if the functions are not normal the thymus remains unchanged and the nuclei also. In disturbances of the stomach and intestinal functions, the pancreatic function being normal, a part of the gland will

reappear, the nuclei, however, having entirely or nearly disappeared. (See Section "Nucleus Test.")

TESTING THE ENTIRE PROCESS OF DIGESTION (STOMACH, BOWEL, AND PANCREAS). In order to test the work of the entire digestive tract, it is best to give a gelatin capsule containing the following test substances attached to beads of different colors: (1) Catgut (white bead), (2) fish-bone (large green bead), (3) raw beef (red bead), (4) potato with skin boiled two minutes (yellow bead), (5) mutton-fat (purple bead), (6) thymus gland surrounded by gauze (blue bead).

FIG. 1



1, catgut bead; 2, thymus bead; 3, fish-bone bead; 4, potato bead; 5, meat bead; 6, mutton-fat bead; 7, digestive test capsule.

The different colors enable us to differentiate the various substances after they have passed through the digestive tract. Such a capsule with the six test substances might be called a "digestive test capsule."

A drawing (Fig. 1) is given of one of these digestive test capsules as well as of each individual test bead in order to show the manner of attachment of the various food substances to the beads.

Method. The patient is given a digestive test capsule shortly after a meal (best after breakfast or dinner) and the subsequent stools are examined by means of a stool sieve, until all six beads have been recovered. These are washed with a little cold water and then well inspected to see whether the substances are still attached or not. The gauze sac

(surrounding the thymus) is cut open and examined for remnants of thymus. If any is present a microscopic examination after staining with methylene blue would be necessary in order to determine the presence or absence of nuclei. The time of the stool, the number and kind of beads found, must be noted.

The occurrence of the first bead marks the time taken to traverse the digestive tract and thus indicates the motor functions of the digestive apparatus.

Radiography in the Diagnosis of Gastrointestinal Disease. In my last article in *PROGRESSIVE MEDICINE*, December, 1905, I referred to the classical observations of Cannon upon the physiology of the gastrointestinal tract which were largely carried out by means of the *x*-rays. During the past year a number of papers have appeared reporting work done, with the attempt to develop methods by which radiography will be of practical use in the diagnosis of the stomach and intestines. In almost every case the article is the result of work extending over several years and the simultaneous appearance of so many papers upon the subject marks the fact that *x*-ray diagnosis has taken its place as one of the most valuable means of diagnosis for this part of the body that we possess. I append a short bibliography and consequently will not make elaborate reference to each paper. Probably the most complete and scientific work upon the subject appears in the papers of Worden, Pancoast, Sailer, and G. G. Davis.

POSITION OF THE NORMAL STOMACH. Before speaking of *x*-ray diagnosis, I wish to quote the opinion of G. G. Davis upon the position of the normal stomach. Many conflicting opinions have been expressed on this subject, but I believe that Davis represents conservative recent ideas upon the subject. He says: "Its cardiac end is situated beneath the seventh costal cartilage one inch to the left of the sternum, about opposite the upper part of the eleventh thoracic vertebra. It is attached to the diaphragm and suspended to the esophagus. The cardiac extremity is practically fixed and retains its position even when the stomach is distended, dilated, or prolapsed. The pylorus is in the midline and moves as much as two inches toward the right when the stomach is distended. It lies opposite the first lumbar vertebra approximately midway between the tip of the xiphoid cartilage and the umbilicus. The greater curvature rises higher in the left hypochondrium than the level of the cardiac opening and descends in the median line to a lower level than the pylorus, its lower edge being two to two and one-half inches above the umbilicus, and may, even when normal, be level with it, thus bringing it opposite the body of the third lumbar vertebra.

"The pylorus is almost entirely surrounded by peritoneum, as is also the duodenum, for its first inch.

"Thus we see that the pylorus is extremely movable within a short radius. The next eight or nine inches of the duodenum are, however, firmly fastened to the spine and the structures lying on it being covered by the peritoneum only in front. Thus it is seen that extensive displacements of the pylorus are combated by the firm duodenal attachments.

"The lesser or gastrohepatic omentum acts as a suspensory ligament for the stomach, but it is attached to the lesser curvature and stretches as it descends.

"These anatomical facts should be borne in mind in studying both the physiology and pathology of the organ. It has recently been impressed on the medical mind that the position of the stomach is more vertical than is usually considered to be the case. But when we remember that the cardiac end is opposite the eleventh thoracic vertebra and the pylorus opposite the first lumbar, we see one is only two and one-half to three inches lower than the other, so that if the stomach is normal it must of necessity be more horizontal than vertical. The question arises, What is its position when dilated? It is obvious that the cardiac end remains in place, but the stretching of the gastrohepatic omentum allows the greater and lesser curvatures to descend. To what extent the pylorus descends is still to some extent in doubt.

"From the firmness and extent of the attachments of the duodenum one would expect it to be held up, but recent skiagraphs have suggested that it too descends."

POSSIBILITY OF ERROR IN DETERMINING THE POSITION OF THE STOMACH BY INFLATION. I have felt convinced for some time past that inflation, while a valuable means of clinically determining the position of the stomach, can give rise to error and should be used with caution. That inflation with air causes some distention of the organ and causes it to assume a position different from that it does before it was distended, has been very forcibly brought to my mind. However, I am not sure that it always sinks. Indeed, subsequent *x*-ray examination in two of my cases, and one observation at operation, showed that inflation caused a ptosed pylorus to rise instead of sink. The point to be remembered is that the pylorus is movable and that the distention with air often causes the stomach to change its position. This is why the *x*-ray picture of the very slightly distended stomach is so much more certain a method of locating its position than inflation. The same statement applies to the colon.

Schule points out a very practical point, namely, that a stomach that is being inflated may push before it a distended colon, and as the colon impinges upon the abdominal wall it may give the appearance and even the percussion note of a distended stomach.

TECHNIQUE OF RADIOGRAPHY OF THE GASTROINTESTINAL TRACT. Probably no one in America is better capable of speaking of the tech-

nique of gastrointestinal radiography than Pancoast. He gives it as follows:

"The x -ray examination by means of the bismuth shadow is applicable to every portion of the alimentary tract below the pharynx. The radiographic technique will be described as applied to the stomach, intestinal tract, and esophagus in the order named. The examinations have been made entirely by the use of the skiagraphic plate. The loss of several lives, the necessary amputations of numerous fingers and hands, and the existence of painful and practically incurable burns among x -ray operators, all due in a great measure to the use of the fluoroscope, should be a warning against any unnecessary use of this instrument for experimental purposes. These grave results, and unfortunately there are others equally serious, make it a most dangerous instrument in the hands of the physician, no matter how carefully it is used or what precautions are taken against exposure. Nothing much less than armor plate is impervious to the rays used in the examination of this part of the body.

"*The Stomach.* The examination of the stomach is the easiest of any portion of the tract, although it must be borne in mind that all of this work is tedious and consumes more time than any other x -ray work.

"The details of the various steps in the radiograph technique follows:

"*Preparation of the Patient.* For a skiagraph of the stomach alone very little previous preparation is necessary beyond having the stomach empty. In the absence of gastric retention, a light and easily digested meal a few hours previous does not necessitate preliminary lavage.

"It is essential that no clothing shall be worn during the operation that will in any way interfere with the details of the skiagraph. Considerable exposure of the person is required in order to place the patient in proper relation to the plate and to bring the x -ray tube in relation to certain landmarks on the body. Unless this part of the work receives careful attention the result of the examination is valueless in determining the true anatomical relations. The exposure of the person is not a matter of much moment to male patients, but it is advisable with women to give due consideration to their feelings of modesty. We are in the habit of having our female patients retire to the dressing-room, where with the assistance of a nurse they don a muslin garment, consisting of a cape and skirt. The cape, fastened around the neck with a draw-string, drops loosely to the hips and is easily lifted up back or front when adjusting the plate and tube. The skirt is held tightly around the hips and just above the pubes by a draw-string. There has never been the slightest objection to appearing in such a costume.

"In order to produce a shadow of the stomach outline, some substance more or less opaque to the x -rays must be introduced. Invariably the

subnitrate of bismuth has been employed, and may be given mixed with solid food, such as mashed potato, or suspended in milk or mucilage of acacia. The former method is perhaps preferable when the gastric motility is to be determined. Up to this time we have in all instances used a suspension of subnitrate of bismuth in mucilage of acacia in the proportion of two ounces of powder to the pint. Even when carefully prepared the bismuth rapidly settles into a compact mass, and for this reason and because of the dangers attending the use of large doses of the subnitrate we are about to experiment with a special permanent chemical suspension of the subcarbonate in water. The objections to milk suspensions are the inability to keep them for any length of time and the difficulty of subsequent lavage on account of curdling. There are two methods of administration, either by the stomach tube or by having the patient drink the emulsion. We prefer the latter, first, because the patient does not have to take the tube twice if subsequent lavage is performed, and secondly, because, as Sailer believes, the bismuth begins to leave the stomach sooner. The pars pylorica and the duodenum are shown better, therefore, when the suspension is swallowed.

"The amount of the mixture employed depends largely upon the results desired. In our earlier cases we used one quart of the suspension or four ounces of bismuth, as this quantity produced a dense and clear shadow, and represented approximately the bulk and weight of an ordinary meal, including liquids. This amount, however, is not always sufficient to demonstrate the extreme degree of dilatation in all cases, but this difficulty may be easily overcome either by administering a larger quantity of a weaker emulsion, or by having the patient drink the necessary quantity of milk before the emulsion is taken.

"Dangers in the Careless Use of Bismuth. The dangers attending the administration of excessive doses of the subnitrate of bismuth are of sufficient importance to demand careful consideration. In addition to four patients in whom toxic symptoms were observed, we have since had two more. In the first few cases four ounces of bismuth were allowed to remain in the stomach; there were no deleterious results, not even constipation; it was concluded that this drug was inert, except for its sedative action, and non-toxic. But unfortunately there soon followed a series of cases in which there developed alarming but not dangerous toxic symptoms, very similar in each instance. In one to four hours after the administration the patients complained of nausea, or even vomited, especially when food was taken. They became markedly cyanotic, and were considerably prostrated. The pulse was rapid and full and the respiration rapid. These phenomena lasted several hours. For a time it was thought that they were manifestations, though not at all typical, of arsenic, or possibly antimony poisoning,

despite the fact that the bismuth used was guaranteed to be free from such contamination. The absence of pain was ascribed to the sedative action of the bismuth. The last or sixth toxic case was a surprise, and was also peculiar in that the emulsion had been administered by enema only. Two ounces of bismuth were used and allowed to remain in the bowel. Absorption must have been confined entirely to the large intestine, because all of our experiments have so far shown that bismuth thus administered is not carried beyond the ileocecal valve. It is possible that the toxic symptoms in this case may have been due entirely or in part to the fact that after the excessive purging attending the preparation of the patient, the walls of the bowel were unusually active in absorption under the sedative action of the drug.

"Confronted by so many of these annoying accidents we determined to investigate the cause of the apparent poisoning. Two separate samples of the bismuth we were using were carefully analyzed by Fetterolf for the presence of poisonous impurities, and both were found to be absolutely free from any traces of either arsenic or antimony. It seems probable that the toxic symptoms arose from the excess of nitrate liberated by the destruction of the subnitrate by the action of the intestinal contents.

"Whatever the cause of these accidents, it behooves us in the future to use every precaution to prevent dangerous results arising from the administration of large doses of bismuth. This method of diagnosis is of too great value and has been too widely adopted to allow us to give it up on account of such accidents. Our rule at present is not to leave over one-half ounce of the subnitrate of bismuth in the stomach, unless the patient can be closely watched for several hours afterward, and even then not more than one ounce should be allowed to remain. If a larger amount has been administered the stomach is washed out as soon as possible after the skiagraphic exposure. One must be sure that the end of the tube reaches the most dependent portion of a ptosed stomach, as the heavy powder always settles there. When the colon has been examined after the bismuth enema a cleansing injection should follow, in order to remove a part, at least, of the retained drug, and a mild purge is also advisable. In gastric diagnosis the administration of bismuth in food will interfere with subsequent lavage, and we prefer not to use this method unless for the determination of motility.

"*Position in Which the Examination is Made.* The examination should be made while the patient is standing, for in this posture the greater curvature and pylorus are sure to drop to their lowest level, especially with the stomach filled with the bismuth mixture. Moreover, it is in this position that patients with ptosis are more apt to have their symptoms aggravated, and is the one usually occupied during the day. Numerous instances have been cited in which the stomach occupied its apparently

normal position, or nearly so, when skiagraphed with the patient lying on the back or side, but a second picture made while standing showed a marked gastropotosis. As the greater part of the stomach, except the cardiac end and the pylorus, approach nearer to the anterior than to the posterior abdominal wall, skiagrams of this organ should be made with the plate in front of the patient and the tube behind, in order to give the best details and to reduce to a minimum errors of projection. If the patient is unable to stand, a picture may be made in the sitting posture.

"In order to obtain a good and accurate skiagraph of this kind, the proper kind of apparatus and its skilful manipulation are essential. Any radiographer of average skill can make satisfactory pictures of the stomach provided he uses a powerful coil and a suitable tube; but the most experienced operator will fail with inferior apparatus. No more beautiful examples of skiagraphic art can be obtained than those of the gastrointestinal tract, but they are without value unless what they portray is accurate. As in all other radiographic work, a stomach picture may be very misleading unless certain details of technique are carefully observed.

"Short *x*-ray exposures are essential and in all persons of average build or thin people should not exceed fifteen seconds. There are several reasons for observing this rule. The patient must stand perfectly still of course. The breath must be held, for respiratory movements prevent us from obtaining a clear outline. Lastly, the exposure must be sufficiently short to prevent peristaltic movements from interfering with the distinctness of the shadows. All of our skiagraphs have been made during full but not forced inspiration, simply because it is easier for the patient to hold the breath with the lungs well filled. Respiration has very little if any influence upon the position of the stomach, though it has been claimed that the greater curvature may descend considerably during forced inspiration. To confirm the findings of other investigations upon this point, two successive skiagraphs were made of one of our patients. The first, made during forced inspiration, showed the greater curvature little if any lower than the second taken during forced expiration. There was a slight change in the shape of the organ.

"A few universally accepted landmarks are necessary for the proper interpretation of these radiographs. The vertebræ, iliac crests, anterior superior spines, and the pubic crests are the normal anatomical bony points, but the position of the umbilicus must always be marked. The shadow of this landmark may be made on the plate by placing a small coin over the spot. If this is to be the point from which measurements are to be made the skiagrapher must be certain that the anticathode of the tube is in the same horizontal plane as the umbilicus and as nearly as possible in the same vertical plane with it and the spine. It is often

desirable to mark the level of the tip of the ensiform, and this may be done in the same way as the umbilicus.

"The Colon and the Sigmoid. The entire large intestine may be skia-graphed by the bismuth method, but with a few exceptions to be mentioned later satisfactory pictures of the small bowel, except possibly the duodenum, have not yet been made. The patient requires more preliminary preparation than in stomach work, as the intestinal tract must be emptied previously by thorough, but not excessive, purgation, and just before administering the bismuth suspension by rectum a simple cleansing enema should be given.

"The usual method employed is to administer the mixture through a soft rectal tube of as large a lumen as possible. The tube should not be introduced farther than three or four inches, or just beyond the internal sphincter. The best results are obtained by observing this rule. The enema must be given slowly, and no force used either by the syringe bulb or gravity beyond about one foot pressure. The principles applied here are different from those of giving high enemata for other purposes. We wish to guard as much as possible against the bismuth being carried toward the cecum by any force except that of antiperistalsis. The one great secret of the operation itself is to allow the liquid simply to trickle through the tube. Once the outlet of the funnel and the lumen of the tube become completely filled it is almost impossible to get the mixture to run in satisfactorily. The amount usually introduced is one pint of the suspension, representing two ounces of the bismuth salt. When the tube is removed the patient should remain in the recumbent posture for thirty or forty-five minutes before the x-ray exposure is made. This time is adopted as a result of the investigations of Sailer and Worden in our laboratory about three years ago. This was the average period required for the bismuth mixture to be carried by antiperistalsis as far as the cecum in sufficient quantity to insure a satisfactory skiagraph. When radiographing the colon the length of exposure, position of the plate and tube, posture, and landmarks are the same as in the technique for the stomach.

"It is often of advantage to have the bismuth reach the colon by way of the stomach and small intestine, especially when determining gastric and intestinal motility, or searching for the seat of a partial obstruction in the bowel. Ordinarily, the bismuth given in suspension should reach the colon in amount sufficient for a skiagraph in twelve to eighteen hours.

"The lower portion of the sigmoid and the rectum are shown best by placing the plate behind the pelvis of the patient, who may be either in the erect or recumbent posture.

"Whenever it is necessary or possible to radiograph the ileum or jejunum the bismuth must be introduced by way of the stomach, in the

absence of a rectal fistula, and the plate is exposed in the same manner as for the colon.

“Esophagus. Aside from the detection of the presence of lodged foreign bodies, the esophagus offers the greatest difficulty of any portion of the alimentary tract to *x*-ray diagnosis, not only for anatomical reasons, but because the rapid movements of deglutition prevent the lodgement of any opaque substance, such as bismuth. The application of skiagraphic diagnosis is limited practically to the determination of the presence, extent, and site of constrictions, and diverticula. Unfortunately, the number of cases referred to our laboratory during the last six months has been very small and we have been unable to give to any particular modification of the bismuth method a satisfactory trial. Two cases have been skiagraphed with accurate diagnostic results, though the artistic appearance of the plates was poor. In one a partial stenosis high up was found and in the other a possible malignant stricture low down was excluded. In both cases the radiographic findings were confirmed at autopsy. It must be admitted that our method of having the patient swallow dry powdered bismuth and washing it down with a small quantity of emulsion is crude, and in the future another way of filling the esophagus will be tried.”

“THE VALUE OF X-RAY DIAGNOSIS. Diagnosis by means of the *x*-rays has been found of greatest value probably in such conditions as fractures and dislocations, foreign bodies, joint disease, and renal calculus; but it seems like a conservative statement to say that we may expect the application of the bismuth method in determining certain conditions of the gastrointestinal tract will in the near future be the next in the order of usefulness. Were it not for the value of this kind of work and the interesting results obtained the tediousness of the dark-room development would give the radiographer sufficient reason for not advocating its frequent application. If the operator is careful in every detail of his technique the results are certain to be accurate. This cannot be said of other methods of examination. The plate shows exactly what is to be shown, and a skiagraphic error is the fault of the radiographic technique or the interpretation of the skiagraph.”

RADIOGRAPHIC DIAGNOSIS OF CANCER AND ULCER. A reasonably certain diagnosis of early carcinoma would be of great value, but as yet this is a very remote possibility. In one of the three cases of this kind examined in Pancoast's laboratory the appearance of the stomach was sufficiently characteristic to warrant a positive opinion, but the disease had reached such an advanced stage that the diagnosis was almost certain clinically, and was confirmed by an exploratory operation later.

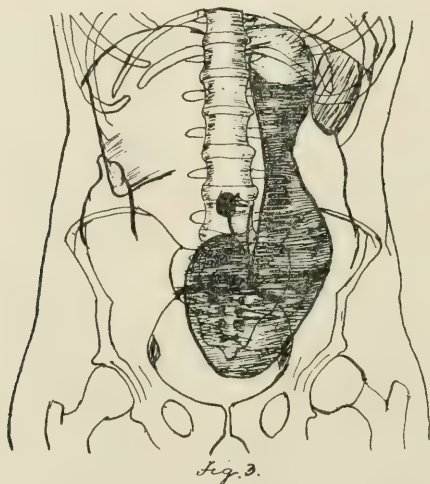
Holzknecht, a private docent of medical radiography at Vienna, says that if the shadow is indented at any point, or if there is a gap in it, or if

the outline is interrupted repeatedly like the bars of a fence, then a tumor should be suspected. He believes that radiography should prove very useful in the early diagnosis of carcinoma.

Hemmeter, in the discussion upon gastric ulcer at the Boston Meeting of the American Medical Association, said that he had diagnosed ulcer by the α -rays and had seen his diagnosis verified at operation.

When a thick emulsion of bismuth is poured into a stomach the seat of an ulcer Hemmeter thinks that the drug will adhere more closely to the ulcerated surface than to the normal mucous membrane, and hence the shadow will be deeper in the ulcerated area. He has performed some experiments upon dogs that appears to show that this supposition is well founded. The subject needs further investigation and is interesting and

FIG. 2



Extreme gastropotosis, with dilatation, low position of the pylorus, and a decided "kink." This is the typical shape of the stomach in the majority of cases of ptosis. The organ occupies a vertical position, and there is more or less narrowing below the cardiac end and the dilated fundus sags downward toward the pelvis. The skiagraph of this case shows the positions of the two flexures of the colon by the differentiation due to the collection of gas at these points. An operation was subsequently performed upon this patient. (Pancoast.)

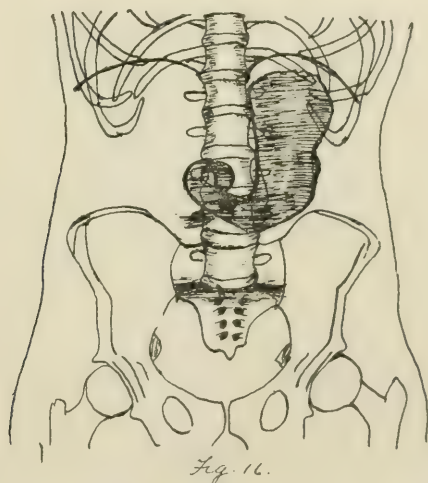
important. It must be said that Hemmeter has not many supporters in his view that ulcer can be shown by radiography.

RADIOGRAPHY OF THE INTESTINE. The large intestine and rectum are comparatively accessible for α -ray diagnosis. The bismuth is introduced by rectal tube and usually is carried well up the colon apparently by reflex peristalsis. Pancoast says that the method of introduction of the bismuth, whether by way of the stomach or by enema must be selected as best suited to each individual case. Ptosis of the transverse colon

and one or both flexures has been easily diagnosed in several patients, and in a few in which adhesions were suspected because of the close relation between two loops, this condition was confirmed by subsequent operation. The seat of malignant stricture in the descending colon was shown after rectal injection of bismuth in one case, and in another in which cancer of the colon was suspected the skiagraph revealed a very marked ptosis of the transverse colon without any constriction at any point. Thorough purgation proved the obstruction to be fecal.

Two cases of malignant stricture of the sigmoid have been examined by Pancoast and the seat of the disease located. In one the bismuth was introduced by way of the stomach because the obstruction was low down, and in the other the emulsion was given by enema. Several examinations have been made by him for ptosis of the sigmoid, with a positive

FIG. 3



Moderate gastropotosis, with hypermotility. (Pancoast.)

result in two cases, and in one of these the diagnosis has been confirmed by operation.

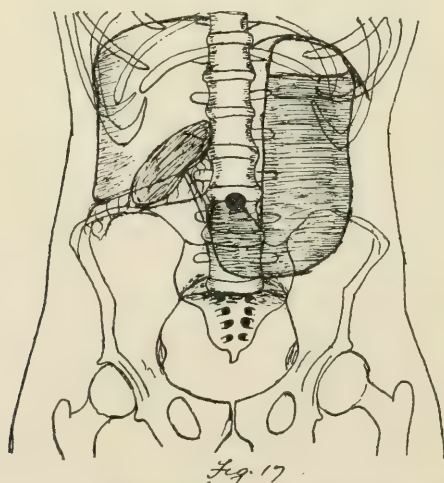
One of the patients skiagraphed for malignant obstruction of the large bowel subsequently passed a large mass of bismuth that had evidently settled in one of the pouches of the rectum or sigmoid. This incident suggested a possible danger of acute obstruction resulting in such cases if such a mass dislodged from one of the pouches above the seat of disease should become impacted within the area of constriction.

I have had a case that was recently examined by Pancoast in which the presence of mucus and occult blood in the stools, rapid loss of weight, anemia and the causeless and sudden onset of diarrhea suggested malignant disease of the colon. Palpation and inflation very faintly suggested

obstruction near the hepatic flexure, although no clinical symptoms of obstruction were present. The radiograph gave a very beautiful and convincing demonstration of a stricture in this position. Operation showed that the stricture was caused by adhesions. The subsequent course of the disease indicated that there was tuberculous ulceration of the large bowel.

RADIOGRAPHY IN THE DIAGNOSIS OF GASTROPTOSIS. Worden and Sailer as a result of their work upon gastroptosis consider radiography the most reliable method of diagnosis in this condition. They say that they have discovered gastroptosis by this means when they could not demonstrate an abdominal position of the stomach by other methods. I must confess that in my experience radiography has never demonstrated gastroptosis when inflation has failed to show it. I have, however, found

FIG. 4



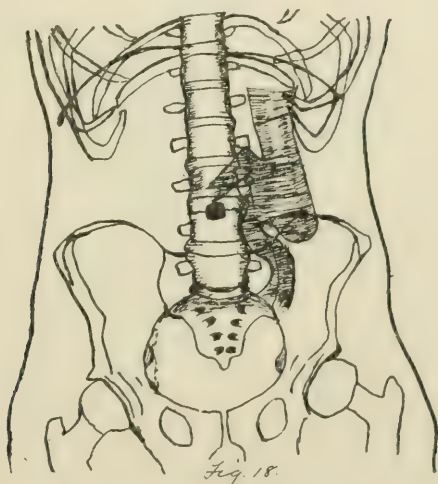
A composite diagram of two skiagraphs, showing a gastroptosis, movable right kidney, and liver displaced downward on deep inspiration. (Pancoast.)

gastroptosis by radiography when the picture was taken in the *upright position*, when inflation in the *recumbent position* did not show it. However, after my attention had been called to the importance of posture in the examination, I then demonstrated downward displacement of the pylorus by inflation while the patient was upright. The effect of posture was still more plainly marked after the patient had been in bed for one or two weeks on the rest treatment. If the work of Worden and Sailer had done nothing but call attention to the value of considering the posture of the patient in the diagnosis of enteroptosis it would be well worth while.

The Shape of the Stomach in Gastroptosis. Worden says: "The shape of the stomach is shown to be most variable. It varies from a pear-

shaped organ lying in a partly horizontal axis to a long stretched-out cylindrical organ, lying almost in a perpendicular position, with a pouch-like expansion at the lowest point or to a J-shaped organ, with the upper extremity at the cardia and the lower extremity at the pylorus, its general axis being vertical. It is believed that the shape of the organ is the same as under natural conditions, the weight and bulk of the bismuth mixture being not more than that of the ordinary meal. A patient is also in a natural standing position without the effect of tight clothing. Although the pictures are taken during full inspiration it is not forced inspiration, and it is not believed that full inspiration affects the position of the stomach to any appreciable extent." Holznecht and Brauner, in a recent article, as a result of watching the stomach by the fluoroscope, claim that it

FIG. 5



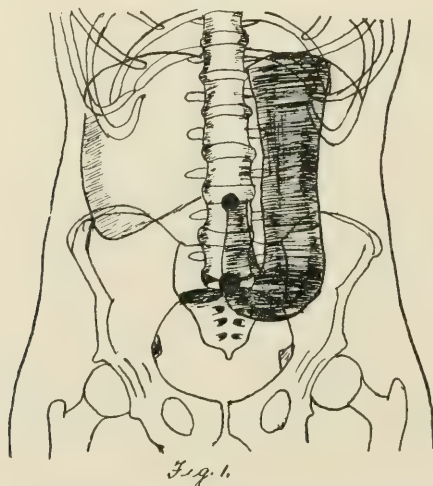
Gastroptosis after gastroenterostomy. The bismuth is clearly seen escaping by both the normal and artificial openings. (Pancoast.)

moves downward four fingers' breadth and changes in shape during forced inspiration. Pancoast took two pictures of the same case, one during forced inspiration and one during forced expiration, and found the difference in the position of the stomach of but little moment, the actual movement downward being about three-sixteenths of an inch, with only slight change in shape. In the study of the shape of these stomachs one point seems of particular significance, namely, that cases of gastroptosis show sometimes a low position of the body of the stomach and an acute angle as the stomach sharply bends to regain the higher pylorus; this forms what Worden calls kinking in the pars pylorica; this is particularly noticeable in the perpendicular tubular stomachs. The stomach can be seen *bending*

on itself so sharply that it is difficult to distinguish the two sections of the stomach.

Worden suggests that this kinking of the stomach has an important bearing upon the motor sufficiency of the organ. When it is present it is possible that there is interference with proper emptying of the stomach. It is not present, however, in every case, but occurred in fifteen of Worden's forty cases of gastropotosis. The suggestion is very timely and ingenious because it is well known that only a portion of cases with gastropotosis show motor insufficiency. Worden fails to say definitely, however, whether these fifteen cases were the ones that showed retention. The subject is, as I have said, a very timely one, for we have reached that stage in the clinical study of gastropotosis when it must be recognized that downward displacement of the pylorus as shown by inflation is not

FIG. 6

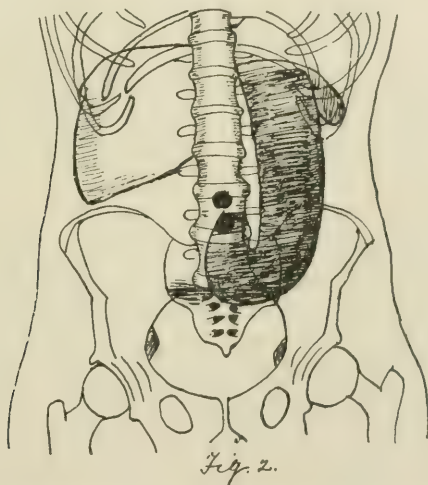


Gastropotosis, tubular shape, with dilatation, low position of the pylorus, and pyloric "kink." (Pancoast.)

the only factor in the causation of the symptom complex that we associate with the name of gastropotosis. From my own studies I believe that downward displacement is an element of some importance, but that there are some other conditions besides displacement that must be present before we have dyspeptic symptoms. What these other factors are it is very hard to say, for the longer we study such cases the more complex they seem. That it is not always the same condition seems probable. Thus every case with gastric symptoms and gastropotosis does not show retention. Therefore, it cannot always be retention that is the added element which makes the dyspeptic symptoms appear. The same thing may be said of secretory changes and gastritis. For the gastric chemistry

is variable and in my experience at least mucous gastritis is a rare condition in gastropotosis with symptoms. That downward displacement is not the only element in the causation of symptoms is clearly shown by two facts: (1) That gastropotosis may exist without gastric symptoms, and (2) after the symptoms disappear by treatment the stomach does not return to its normal position in many cases at least. Therefore, the discovery that Worden and Sailer have made that in some cases of downward displacement of the pylorus there is a distinct kink in the stomach itself, is a very valuable addition to our knowledge of the subject even though it does not appear in every case with symptoms. The occurrence of such a kink in the duodenum has long been suspected in gastropotosis but has not as yet been satisfactorily demonstrated.

FIG. 7



The same patient, skiagraphed after application of an adhesive abdominal support. The umbilicus has been elevated with the flaccid abdominal wall. The effect upon the stomach seems to be a very slight elevation and alteration in contour of the greater curvature. The "kink" is less pronounced. There was more relief of symptoms than the skiagraphic appearance would seem to indicate. (Pancoast.)

RESULTS OF TREATMENT OF GASTROPTOSIS AS SHOWN BY RADIOGRAPHY. This part of the work done in the University Hospital is very interesting and important. Worden says: "In one case with extreme prolapse, dilatation, low pylorus, and kinking at the pyloric portion, an abdominal support of adhesive plaster consisting of long strips of plaster passing from below the stomach in a curved line upward and outward, passing across the abdomen and posterior thorax to a point between the scapula, overlapping each other, relieved the symptoms of poor motility." (See Figs. 5 and 6.)

A picture taken with this support on showed the stomach little if any elevated; the support evidently had altered the shape of the stomach, enough to allow better drainage from the pylorus.

Sailer suggests that this alteration in the shape and obliteration of the kink may be the explanation of the benefit derived from operation involving the shortening of the gastrohepatic ligament such as that devised by Beyea.¹

Palpable Kidneys in Children. Almost without exception pediatricists are agreed that movable kidney is a very rare condition in childhood. The most notable exception is Rosenthal, who claims to have palpated the kidney in twenty-six out of fifty-one girls and three out of thirty-two boys. Otto Blum² has made some investigations upon this subject. He adopts Kuttner's definition of a movable kidney which includes every kidney that can be felt to move with respiration. According to Kuttner's classification there are four grades of dislocation: (1) A merely palpable respiratory motility without appreciable dislocation; (2) a dislocation of the first degree, *i. e.*, a kidney palpable in one-third to two-thirds its length, movable with respiration, capable of being displaced by the hands and more or less dislocated forward; (3) a dislocation of the second degree, *i. e.*, a kidney palpable throughout its length; (4) a kidney fixed in a dislocated position.

Blum's investigations were made in children of both sexes, between the ages of three and fifteen years. They belonged mostly to the lower classes, were often very anemic and poorly nourished, and frequently exhibited the sign of Stiller's "enteroptosis type," the floating tenth rib. None were emaciated to any considerable degree. They never exhibited the symptoms belonging to movable kidney in adults. There was seldom any pain connected with the palpation of the kidneys. The examination was made with the subjects erect, as he found that the kidneys were more easily palpated in that position.

Out of 106 children who were examined, Blum found palpable kidneys

¹ Recent bibliography upon radiography of the gastrointestinal tract. Worden, Pancoast, Sailer, G. G. Davis, Univ. of Penna. Med. Bull., August, 1906. Rieder, Münch. med. Woch., August 30, 1904, No. 35. Cannon, Jour. Amer. Med. Assoc., March 21, 1903. Hulst, Physician and Surgeon, September, 1905. Neumann, Wien. klin. Woch., 1904, No. 24. Gallant, Internat. Clinics, 1905, vol. iv, 14th series, p. 178. Holznecht and Brauner, Wien. klin. Rundschau, xix, 1905, p. 273. Pfahler, Archiv. of Phys. Ther., July, 1905. Dalton and Reid, Lancet, April 1, 1905, p. 861. Tousey, N. Y. Med. Jour., May 21, 1904. Schule, Archiv. f. Verdau. Krank., Berlin, 1905, xi, p. 509. Williams, The Roentgen Rays in Medicine and Surgery. Hulst, Archiv. of Phys. Ther., January, 1906. Einhorn, Ibid., September, 1905. Konried, Le Progrès Méd., Paris, 1906, vol. xxii, p. 113. Dalton and Reid, Trans. Clin. Soc. London, 1905, xxxviii, p. 122. Holznecht, Berl. klin. Woch., 1906, xliii, p. 127. Brauner, Archiv. f. Phys. Med. u. Med. Tech., Leipzig, 1905, i, p. 11. Steele and Francine, Univ. of Penna. Med. Bull., December, 1903.

² Berl. klin. Woch., Ewald Fest-Nummer, October 30, 1905, p. 105.

37 times. In 16 cases the right kidney alone was felt, while both organs were movable in 21 cases; the left kidney alone was never movable. More cases occurred above ten years than below that age. The degree of dislocation is seen in the following tables:

1. Right Kidney Alone.		
First degree	5	CASES
Second degree	7	"
Third degree	4	"
	—	
	16	
2. Both Kidneys.		
Right kidney.		
First degree	2	CASES
Second degree	3	"
Third degree	8	"
	—	
	13	
Left kidney.		
First degree	6	CASES
Second degree	5	"
Third degree	2	"
	—	
	13	

In no case could any appreciable gastropotosis be detected, nor any abnormality in the gastric contents. Marked gastric atony was present in 5 cases. Orthostatic albuminuria was found in 11 out of the 37 cases suggesting a possible relation between the two conditions.

These investigations seem to show that nephroptosis may occur in childhood, without the possibility of those etiological factors which are usually held responsible for its development in adults, *i. e.*, pregnancy, tight lacing, traumatism, relaxation of the pelvic floor, sudden emaciation, etc. According to Rosengart's investigations the fetal position of the internal organs is similar to that found in splanchnoptosis. The question, therefore, arises whether nephroptosis of childhood may not be due to an arrest of development or to a congenital disposition. Blum's investigations have especial interest in view of the fact that certain observers, notably Stiller, claim that a congenital predisposition is present in every case of splanchnoptosis. We must remember, however, that it is easy to palpate the abdomen of children, and I suspect that the methods of palpating kidneys in the adult as applied to children may lead to confusion; and just as it is easier to palpate the liver and spleen in childhood than in adult life, so the kidneys may be more accessible to examination. Still the number of cases that showed a decided degree of motility is very striking and Blum's work goes far to suggest that the congenital element is important in the causation of splanchnoptosis.

The Etiology and Treatment of Chronic Constipation. In chronic constipation more than in most conditions the treatment must be based intelli-

gently upon morbid physiology. The only proper means of remedying the disturbance of function is by first studying the various morbid conditions under which constipation can arise and classifying the different forms of the disease. For constipation arises from a great variety of conditions. It is a symptom common to intestinal spasm, to atony, to obstruction, and to various disturbances of digestion and absorption that I am about to discuss in detail.

It will be seen that a proper diagnosis of the cause of constipation is absolutely essential for its intelligent treatment, because remedies that will help one form will do damage in another.

It is always difficult to compare the frequency of the occurrence of diseases from one generation to another. But it does seem as if constipation is increasing and extending. The conditions of modern life are such that this is to be expected. The increased facilities for transportation interfere with proper exercise, and the rush of modern life often leaves no period in the day for regular going to stool. Thus we derange the habit that is a most important part of the mechanism of regular evacuation of the bowels.

It is needless to remark that the character of our food plays an important part in the etiology of constipation. This fact has always been recognized, whatever has been the theory of the mechanism of its causation. The recent work of Schmidt and Strasburger has shown that the way in which the character of our food influences the action of the bowel is quite different from what has been generally supposed. We have always thought that the direct cause of what has been called atonic constipation was weakness of the wall of the intestine. However, Schmidt and Strasburger have shown that this form of constipation is due, not to atony of the muscle, but to too complete digestion and absorption of food in the intestine. As a consequence, the intestinal bacteria have not food enough left for their growth and, therefore, they cannot form the various substances, such as gas and acids, which appear to be normal and necessary stimuli to the intestinal wall, and the intestine lacking this stimulation fails to work properly. Thus, the eating of well-cooked and easily digestible foods to the exclusion of all others would increase the tendency to chronic constipation of this type; and another reason why modern conditions favor constipation may be found in the fact that knowledge of scientific cooking is becoming more widespread and must have considerable effect upon the diet of our urban population. There are cooking schools in most of the endowed trusts' schools, and in some public schools, and the cooking departments in the newspapers and women's journals are gaining in importance. All of these educational agencies lay considerable stress upon the digestibility of food and its preparation so as to be digestible—whereas, in the cook books of our

ancestors, the savouriness of a dish was its chief if not its only recommendation. This tendency to greater attention to the digestibility of food may well be one cause for the increase of constipation. Moreover, the physical character of the foods themselves probably play some part; such as roller flour, the various cereal foods that have been thoroughly cooked before being exposed for sale, and the use of vegetables canned when they are young and tender instead of being preserved by drying.

The best among the text-book writers all emphasize several important points in the treatment of constipation, namely, that constant use of strong cathartics is certainly not the way to treat chronic constipation; that diet, regulation of habit and exercise are the best ways of combating it, and that infrequent evacuations are often consistent with perfect health. We will, I think, all acknowledge the truth of these axioms. Still, to those of us who practice medicine, chronic constipation remains one of the most trying conditions that we are called upon to treat, because the prescribed diets generally fail to do what is expected of them; secondly, regulation of exercise and habit are exceedingly difficult to enforce in busy patients; and thirdly, it is almost impossible to convince our patients that they exaggerate the results of constipation. Especially is this so in the treatment of neurasthenia. Therefore, we must welcome the scientific study of the causes of constipation and the attempts to develop a rational treatment based upon the morbid physiology of the condition. Let us first see upon what evidence the theory of Schmidt and Strasburger is based.

THE CHARACTER OF THE STOOLS IN SO-CALLED ATONIC CONSTIPATION. Schmidt¹ has studied a large number of cases of this so-called atonic constipation, and has found that the stools are not only poor in water but also that the dried weight of the fecal matter passed in constipation is decidedly less than in normal persons. At the same time microscopic examination shows that there is an extraordinarily small amount of food remnants in the feces. I have studied a number of cases of constipation and can confirm Schmidt's statements, especially as to the too perfect digestion and very small amount of food remains. Such stools consist almost entirely of granular debris and bacteria. In considering this last statement it must be remembered that quite a large part of normal stools consist of bacteria.

Strasburger² found that the total amount of bacteria in the feces of chronic constipation was much smaller than normal (only about two-thirds as much). The significance of this is striking in its bearing upon what I have said concerning the harmlessness of moderate constipation.

¹ Münch. med. Woch., 1905, No. 41, p. 1970.

² Ztschr. f. klin. Med., 1902, Band xlvii, p. 413.

Lohrisch,¹ on Schmidt's suggestion, has undertaken a systematic investigation of the stools of cases of constipation passed while the patients were on the test diet. He found that the normal dried substance of the stools of three days' diet averaged 59.3 grams, while in constipation it averaged but 33.9 grams. This indicates that digestion and absorption had been too perfect. When opium is given peristalsis is inhibited and a condition simulating atony of the bowel is produced, approaching what we have supposed to be the condition in so-called atonic constipation. Lohrisch and Schmidt found that when they gave opium to normal persons the watery elements of the stool only were reduced while the dried substance was not altered. This indicates quite strongly that lack of peristalsis cannot of itself produce the condition that we have called atonic constipation. No doubt weakness of the bowel muscle plays some part in the production of constipation, but, as Schmidt says, it appears to be not the most important factor.

The prominent causes are the too perfect digestion and absorption of food, the poor growth of the normal bacteria of the bowel, and the consequent lack of the products of fermentation, which are the normal stimulants of peristalsis. Another characteristic of constipated stools that Schmidt mentions, and which I myself have often noted, is the absence of vegetable detritus, although the diet contains at the time considerable fibrous vegetable material that is normally found in the feces almost unaltered. Schmidt explains this by the supposition (and we confess it appears to be merely a supposition) that the intestinal juices of constipated persons have more power of digesting cellulose than normally. Whether this can be proven or not, and whether we can determine in what digestive secretion this power lays, I do not know. But at all events this supposition answers very completely many of the puzzling questions in connection with constipation.

1. It explains why the most carefully formulated diet which is calculated to give the intestinal walls more bulky foods to work upon usually fail entirely to cure the constipation, because the materials that we count upon to act as ballast are those rich in cellulose. If, then, this cellulose is digested no effect is obtained. Schmidt has shown that constipated stools are very poor in cellulose.

2. It explains why the stool of constipation does not contain more cellulose, although a good amount of vegetables are ingested; and also why the actual amount of bacteria are less in constipation because cellulose is the main food of the intestinal flora. That the too perfect digestion of the cellulose is due to bacterial action is unlikely, because, as I have said, the bacteria are actually less in constipation.

¹ Deutsch. Arch. f. klin. Med., 1904, Band lxxix, p. 383.

THE ABSENCE OF BACTERIAL ACTION IN CHRONIC CONSTIPATION. These facts indicate very plainly what I have said, that the best observers have noted clinically, namely, that there is no undue intestinal fermentation in constipation; and apart from the neurasthenic symptoms, the subjects of this form of chronic constipation suffers no bad results from a moderate degree of uncomplicated stagnation of feces. On the contrary, Schmidt shows that the stools of constipation do not ferment at all. Such evacuations are hard, alkaline, and usually quite free from odor. I have confirmed this observation in my own work.

This series of facts throws some light upon the statements of various authors that the indican of the urine is increased in cases of stagnation of the feces. As Schmidt very lucidly remarks, such statements are made without any effort to investigate the condition of the stools. It seems probable that the absorption of indican and not its formation is increased by stagnation. Indeed, it is likely that its formation is absolutely diminished.

Schmidt's whole investigation appears to contradict the assumption that bad effects always follow chronic constipation. While we cannot doubt that at times some toxemia must follow serious fecal stagnation, especially when there is an element of fermentation added, still Schmidt's work indicates that we can very easily exaggerate the amount and danger of absorption of intestinal poisons. It certainly places the burden of proof upon those observers who are fond of claiming intestinal autointoxication as the cause of so many conditions. And, if I am not very much mistaken, the theory of intestinal autointoxication in constipation at least has very little foundation in experimental evidence.

AGAR-AGAR AS A FOOD IN CONSTIPATION. Since cellulose is digested to an undue extent in the intestine of a person subject to constipation, the rational treatment of the condition would be to find some food substance that is voluminous, rich in water, and in which the cellulose is in such a form that it will not be digested. Besides, this substance must be unirritating to the mucous membrane. Such materials are not easy to find. In his search Schmidt has even tried cork and similar materials, but without the desired results, since although these substances made the stools more voluminous they were not rich enough in water to keep the feces soft, which last condition is of course, desirable. Schmidt has discovered at least one substance that fulfilled all the conditions. This is the preparation of Japanese sea weed, known as agar-agar, which is so well known in bacteriological work. It swells easily in water and gives up the water again very slowly. It contains 0.6 per cent. of cellulose in a form that is apparently not easily digested. It also resists bacterial action.

Schmidt found that if agar-agar is given by the mouth it rapidly swells

in the mouth and stomach and is passed in the stool practically unchanged. The stools are soft, rich in water, and were passed more promptly than usual. Agar-agar is not irritating even in large doses, except when given in a powdered form. It then produces pain and diarrhea, which are probably caused by the too rapid and excessive swelling while in the gastrointestinal tract.

In chronic constipation the ingestion of moderate amounts of agar-agar causes large, soft stools. The significant fact is that the dried weight is increased and increased much more than would be explained by the weight of the ingested agar, showing that the agar carries the fecal matter through the bowel with it. However, the passages are usually not passed spontaneously from the rectum. Schmidt suggests that the reason why the stools are not spontaneous is that the bowel still lacks the stimulus of the products of bacterial action since agar does not favor bacterial growth. That is, agar remedies the excessive digestion but does not furnish the needed stimulus to spontaneous evacuation.¹

In order to correct this lack of stimulation, Schmidt has added a small amount of extract of cascara to the preparation, not enough to act as a laxative but merely to furnish a little stimulation to the bowel wall. He used the agar as it comes in strips cut into convenient lengths. To this combination of agar and cascara he has given the name "*regulin*," signifying that its action is to regulate the action of the bowel by reproducing as nearly as possible the normal relation of food and the mucous membrane of the intestine.

Agar in this form can be given in apple sauce or other sweets, or in mashed potato, in amounts of 30 grains to 2 drachms daily.

The substance works as well in spastic as in the atonic form of constipation. Schmidt has used *regulin* in twenty-five cases of constipation of various sorts, and in two-thirds of them the agar therapy gave very good results. The other one-third needed other forms of treatment besides, such as physical methods supply. One must not be disappointed if the method does not give very prompt results. It is after all a treatment by diet and not by drugs, and patience and perseverance are needed to obtain the result looked for.

PARAFFIN IN THE TREATMENT OF CHRONIC CONSTIPATION. Another substance that fulfils most of the conditions required for an intestinal ballast is liquid paraffin. It is liquid, passes unchanged, is unirritating, and can be rather more readily given than agar. Schmidt employs the

¹ It may strike one as peculiar that the statement is made that agar-agar does not favor bacterial action, although the substance is used for culture media. It must be remembered, however, that agar is merely used as a framework of the culture media; and, indeed, is so used because it is resistant. The pabulum for the culture is the meat extract, etc., that the agar culture tube contains.

liquid paraffin of the German pharmacist. But he has also used the American liquid white or yellow vaseline with equally good results. Paraffin acts much as does agar and needs the addition of a small amount of cascara to produce the best results. Schmidt terms this mixture "pararegulin," and gives it in capsule. Regulín and pararegulin act very well together.

THE MECHANICAL TREATMENT OF ATONIC OR CHRONIC CONSTIPATION. As I have said, the etiology of constipation is too complex to expect that we can cure every case or indeed any one case by correcting only one morbid condition.

Even if atonic constipation is caused primarily by errors in diet, as Schmidt's investigations very strongly indicate, it seems probable that weakness of the bowel wall plays an important part in most cases.

In some cases it is conceivable, as Nothnagel has suggested, that intestinal innervation is at fault and we have to do with a true atony. Pure cases of this sort are probably rare. But cases of constipation from improper diet may well occur much more easily in cases in which the whole nervous system is below par than in normal individuals.

Again, constipation from improper diet, especially if combined with carelessness of habit, will probably cause disturbance in the intestinal muscle secondarily and this will need correction before we can hope to overcome the sluggishness of movement in the intestinal contents. The intestinal muscle can probably be influenced best by mechanical measures.

Here it is very essential to distinguish sharply between atonic and spastic constipation. What I have said in the last few sections applies to the atonic form. Let us now consider the mechanical treatment of this variety, reserving the methods of treating spastic constipation for a further paragraph.

The so-called physical remedies are very clearly given by Ernst Tobias¹ and I shall quote freely from his article.

Hydrotherapy. This treatment is very useful in influencing the bowel probably as much by improving the general tone of the system as by any action that it has upon the bowel wall. It has the advantage that it can be given so as to occupy only a part of the patient's day and allow him to go about his usual pursuits. Tobias is fond of using the so-called thermic contrasts. Heat is applied in the electric light cabinet or steam-room or cabinet. Then cold is applied in the half-bath or Sitz bath, the temperature varying from 28° to 18° C. (82.2 to 62.2 F., depending upon the age and strength of the patient. This is combined with general cold douching, or the Scottish body douche can be given. This latter furnishes a very strong stimulation for the bowel.

¹ Berl. klin. Woch., 1906, vol. xliii, No. 6.

Massage is often of the greatest use if properly given, and of no value if not applied as it should be. Tobias insists that it be given by an expert, and by the hand only, as he has discarded the vibrating machine as useless. The treatment must be systematic and prolonged until a satisfactory result is obtained. Massage promotes the thorough emptying of the bowel, helps the flow of intestinal secretion and probably influences favorably the nervous mechanism of the bowel wall.

Gymnastics. There is no question that chronic constipation is influenced favorably by exercises that strengthen the abdominal wall. The so-called room exercises and resisted movements are best. In these the patient lies on the floor and raises himself to a sitting position by catching his toes under a piece of furniture and using his hips as a fulcrum, or raises his leg by flexing the hips and so on. Various systems have been formulated for this form of treatment. Sports are to be encouraged, such as riding, walking, rowing, and golf.

Electricity. Certain observers, especially Hunerfauth in Erb's clinic, have found that the faradic current was often of benefit. The faradism may be abdominal entirely, or lumbo-abdominal or recto-abdominal.

Balneology. Tobias is opposed to the treatment of chronic constipation at the various watering places. He considers this form of therapy to be little different from the habitual use of laxatives; as almost all the waters used in such cases are more or less powerful solutions of saline purgatives. This seems a reasonable view and it is probable that the benefits that have come to cases of constipation from a sojourn at these resorts are due to the exercise and careful regime and come in spite of and not because of the water.

DANGER OF OVER-STIMULATING THE BOWEL BY PHYSICAL TREATMENT. The danger of overstimulation must not be forgotten in this form of treatment. It may easily occur if any one of the treatments is given daily, especially when the patient is not in an institution but is going about his usual occupation. Thus massage and hydrotherapy should be given on alternate days and each day a little exercise can be taken, slowly increasing.

SPASTIC CONSTIPATION. Considerable attention has been paid of late to that form of constipation which is supposed to be produced by spasm of the bowel, especially of the colon. I think there is no doubt but that there is a form of chronic constipation that is associated with general nervous irritability, and is more or less of the spastic type. Whether it is so frequent and important as is claimed by some observers, I think may be open to question. The extreme type of the condition is of course the constipation of lead colic or of the colon spasm that is spoken of below.

According to Albu¹ the milder chronic form usually occurs in women

¹ Therapie der Gegenwart, 1905, Band xlv, No. 5., and Medical Record, July 1, 1905.

of a neurotic type, who frequently show spastic conditions in other parts of the body as cardiospasm, pharyngeal spasm, and so on. The general nutrition is apt to be poor. The abdomen is usually not rigid but is flaccid and relaxed. The bowel itself is often tender and in extreme cases can be felt to be contracted in knots through the abdominal wall. The sphincter ani is very often firmly contracted. The physical character of the stools is often important in diagnosis. They are of small calibre, often as small as a lead pencil or little finger and broken into pieces, sometimes large and sometimes small, giving the impression that the stool has passed through a spasmodically contracted intestine. The stools are very small in amount and the desire for defecation is often present without result. As the spasm passes the physical characteristics of the stool return to normal and this variation in their form is an important point in the diagnosis.

Treatment of Chronic Spastic Constipation. The diet naturally must be unirritating, but at the same time must be directed toward improving nutrition. Fats are a most useful food, as they fulfil both of the above conditions, and one of the best forms in which it can be given is milk or cream.

Hydrotherapeutic Measures. The physical treatment of spastic constipation is, of course, just the reverse of the treatment of the atonic form. All stimulating hydrotherapy must be avoided, especially the thermic contrasts.

Tobias¹ has obtained very good results from the cold wet pack applied to the whole body for one to one and one-half hours. This is followed by sponging or spraying the body with tempered water with not too much pressure. All procedures that stimulate the bowel are, of course to be avoided. For cases with much colic-like pains, warm compresses and other means of applying heat locally are often of benefit. In general, however, Tobias tries to avoid local procedures.

Massage of the abdomen and *faradism* are, of course, contraindicated. *General massage* and *gymnastics* suited to improving the general tone of the individual may be permitted, but all local stimulation must be forbidden.

In some cases general exercise taken cautiously and under the control of the physician seems to do good, but its effect is often uncertain; and certainly all great exertion must be avoided. All athletic sports are to be forbidden. As a rule, the more rigidly the patient is kept at rest the better is the result. As has been said, probably the best remedy is prolonged wet packs, which often are successful in producing a normal stool.

I have found oil enemata very successful in my cases of mucous colic

¹ Loc. cit.

when the constipation is of this spastic type. The oil is given as high as possible into the colon through a large catheter, while the patient is on the back with the hips raised. Six to eight ounces can be given once every day or every other day and the oil is allowed to remain in the bowel as long as it will stay. It seldom fails to produce one or more easy stools in the twenty-four hours. The patient must be warned not to try to go to stool whenever they fancy that they have a desire and the less their mind is allowed to dwell on this part of their body the better.

Tobias advises that an attempt be made to train the bowel by going to the closet once daily always at the same hour whether a result is obtained or not. Various drugs have been recommended by different observers, such as bromides, belladonna, and opium and belladonna, by suppositories. Of course, all purges are to be avoided, as their use will always aggravate the spasm. The mineral-water cures are to be avoided for the same reason. Dilatation of the sphincter and hypnotism has been tried with varying success.

CHRONIC COLON SPASM OF A SEVERE TYPE. This is an advanced stage of spastic constipation. I must repeat that these observations are given for what they are worth. There seems no doubt, however, that spastic contraction of the large intestine is a matter of importance to which too little attention has been paid. Whether it frequently occurs in such a severe form as the cases that are reported below and whether chronic spasm is of frequent enough occurrence to be recognized as a separate cause for constipation must be settled by further study. However, we should welcome all the light on the subject that is offered.

Chronic spasm of the colon is characterized by attacks of sharp pain along the course of the large intestine, including the sigmoid flexure. During the attack the colon is tender to pressure and can usually be palpated as a firmly contracted cord about as large as a man's finger. There is no tenderness anywhere else in the abdomen except along the course of the colon where the pain is exquisite. The abdominal walls are sometimes moderately rigid, but extreme contraction is not a characteristic of the condition. The attack is accompanied by absolute constipation which is not relieved until the spasm passes. The attack sometimes lasts with varying intensity for a week or longer. When the paroxysm is over the pain stops at once and there is usually a movement of the bowels. Although the contraction of the colon seems intense enough to cause obstruction of the bowel, no case of ileus has ever been reported. The severity of the pain usually suggests peritonitis, but the lack of pronounced rigidity, normal pulse, normal temperature and breathing marks the condition as an entirely local process.

Schütz¹ reports three patients who showed chronic colon spasm of

¹ Archiv. f. Verdauungskrank., 1905, Band xi, p. 324.

a severe type. All three were decidedly neurotic. Their ages at the beginning of the attacks ranged from fourteen to twenty-one years. The attacks usually followed some nervous shock or disease in some other portion of the body, in one case pulmonary tuberculosis. All three patients were anemic, but their nutrition was fair and there was no marked disturbance of digestion. In all of the cases the attacks were preceded by a period of diarrhea, and considerable mucus was passed in the stool. In the interval between the attacks the bowels were constipated and mucus was never found.

Schütz discusses the etiology of the condition and concludes that it may be and probably is secondary to some inflammatory condition of the intestine, but that it sometimes occurs apparently as a primary intestinal neurosis, as in the third case, where there was no sign of intestinal disturbance. However, even in the secondary cases there must be a very sensitive condition of the intestinal nerves.

Chronic spasm of the colon must be distinguished from lead colic, the intestinal crises of tabes, gallstones, gastric ulcer, and other painful affections of the stomach. The diagnosis should not be difficult and rests upon the history and the general symptoms. In colon spasm, there is sharp pain, the colon can be palpated through the abdominal wall and there are absolutely no signs of peritonitis or general disturbance.

Since observing these severe cases, Schütz has seen a good many patients in which he recognized a milder grade of this condition. He believes that the disease is more frequent than is usually thought and is a matter of some clinical importance. The prognosis is not encouraging. In two of Schütz's cases the attacks recurred when the patients' general condition was not good. The treatment of the attack is much that of lead colic, which indeed it closely resembles in its clinical symptoms. Full doses of opium, avoidance of cathartics, which usually aggravate the spasm, rest in bed and liquid diet, are the measures which should prove most efficacious for the treatment of the spasm. After the acute stage is past gentle catharsis is indicated with oil enemas and Karlsbad salts. The after treatment is general as well as local, and consists in restoring the nervous equilibrium, eliminating irritating conditions in the bowel, and so on. Energetic massage is, of course, contraindicated.

The Best Means of Reducing Intestinal Fermentation. (Intestinal Antiseptics.) An interesting side light is thrown upon the therapeutics of intestinal toxemia by the work of Strasburger, who has found by his method of measuring the bacteria of the feces that starvation of the bacteria is the only certain method of reducing their activity. This, of course, may be accomplished by either a purge which carries away their food, or a limitation of the food ingested by the individual. He found that so-called intestinal antiseptics have very little effect. The question

of the value of antiseptic drugs in checking processes in the intestine that appear to be due to bacterial action has long been debated.

The work of Strasburger shows definitely that too much must not be expected of such remedies. Alone it is probable that they will have little effect in reducing intestinal fermentation. Indeed, it is a question in my mind whether the good effects that are seen after their use are not due as a rule entirely to the modifications of diet that is made while they are administered.

However, the use of antiseptic drugs has the endorsement of long usage and a remedy seldom has this to recommend it until it possesses some real value. In this case it seems probable that they play a more subordinate part than we have previously thought.

The checking of intestinal fermentation and the disturbances that it produces must be accomplished by the inhibition of the growth of the intestinal bacteria by emptying the bowel and by cutting off the food upon which the bacteria flourish. The possibility of permanent cure of the intestinal disturbance will depend upon whether the cause can be discovered and removed.

One of the most fruitful causes of fermentative diarrhea is the discharge from the stomach into the intestine of large amounts of fermenting and badly digested food.

Intestinal Disturbance of Gastric Origin. There is no doubt that much fermentative diarrhea is gastrogenic; that is, it occurs because, for some reason, the food leaves the stomach in an undigested and fermenting condition. In those cases in which the intestinal secretions cannot digest it promptly, an enteritis is started. Probably the condition of the stomach that most favors these conditions is a lowered secretion of hydrochloric acid combined with gastric motor insufficiency. The stagnating chyle ferments more quickly when hydrochloric acid is absent, and moreover, when no free hydrochloric acid enters the intestines, the pancreatic secretion must be imperfect, because the activity of the pancreas is largely dependent on the acid reflex in the first portion of the duodenum.¹ The administration of hydrochloric acid will always help these cases and if the motor insufficiency can be removed at the same time by diet and restoring the tone of the gastric muscle, the cause of the enteritis will be removed. It is surprising how many cases one sees in practice when an obstinate diarrhea will yield if approached by way of the stomach.

An example of this form of diarrhea is that seen in achylia gastrica from any cause. If unaccompanied by stagnation of the gastric contents, the intestinal disturbance will often yield to the administration of good amounts of hydrochloric acid, and this often the only remedy required. Such diarrhea is the next frequent indication for hydrochloric acid in

¹ PROGRESSIVE MEDICINE, December, 1905.

achylia, for, as a rule, if the gastric activity is normal and the intestinal digestion good there is no need of attempting gastric digestion at all.

Another example is the beneficial effects that usually follow the administration of hydrochloric acid in typhoid fever. Here it is generally assumed, and apparently correctly, that the febrile process lowers gastric secretion. At all events, it is the writer's experience that sufficient doses of hydrochloric acid combined with modification in diet is the most efficient method of treating diarrhea and distention in typhoid fever. By sufficient dosage is meant 15 to 30 drops of dilute hydrochloric acid *after each feeding* and not three or four times daily. The routine use of this remedy in typhoid fever for two years has given good results in preventing intestinal complications. Certainly as good as the use of anti-septic drugs. The disturbance is probably of gastric origin primarily, and the hydrochloric acid serves the triple purpose of aiding gastric digestion, of preventing gastric fermentation, and of stimulating pancreatic digestion.

Of course, it must be remembered that an infected milk supply is a very important source of intestinal trouble in typhoid. An instance of this was Edsall's experience at the Episcopal Hospital in Philadelphia, where an epidemic of diarrhea and gastrointestinal disturbance in the typhoid wards promptly ceased when the milk was pasteurized. A bacteriological examination had shown that the supply was badly contaminated.

The Morbid Physiology of Visceral Pain. There is no one sign of visceral disease more valuable than the existence of pain. Heretofore we have known very little about the mechanism of its production and there has been much in the manner of its distribution and of its radiation that has puzzled us. Thus pain in abdominal disease does not always occur in the locality in which the affected organ lies, and if it does occur in the place in which we would expect it, the manner of its radiation is often quite unexplainable. Recent investigations have thrown considerable light upon the subject and in time we may hope to thoroughly know the different sensory paths in the abdomen and their anastomosis, and then pain will be even more important in diagnosis than it is now. The old and natural idea of the production of abdominal pain was that the viscera themselves contained sensory nerves and when inflammation occurred pain was produced in the organs affected. We explained the radiation of pain by assuming that the nerves of the sympathetic system carried the pain from one plexus to another and in this way disturbances of sensation were often produced in parts of the abdomen remote from the lesion.

We find, however, that the production of abdominal pain is much more complex than we thought. We are led to this conclusion for several reasons.

First, it appears to be quite well established by observation upon the human subject during abdominal operations under local anesthesia, that the visceral peritoneum and the viscera themselves are not sensitive to handling, to heat, or to cold. Therefore, the evidence is much against the supposition that pain originates in the different organs themselves. This has been shown by Lennander and Wilms, and has been noted also by Mackenzie, Kelling, and others. All of these observers, except Mackenzie, say that the parietal peritoneum is sensitive. Mackenzie, on the other hand, says that sensibility lies not in the parietal peritoneum itself, but in the subperitoneal tissues and the serous membrane itself has no feeling. Unless the observer was looking for this particularly it would be very easy to confuse sensibility of subserous tissue with that in the membrane itself. And on its face, the theory of Mackenzie is very reasonable. It certainly harmonizes with the fact that the visceral layer is not sensitive.

Second, when we consider the character of the experiments of the physiologists undertaken to determine the power of the sympathetic fibers to carry sensation, we must realize that there is no good proof that the sympathetic system can carry sensory impulses at all. In the experiments upon animals we can never be sure that pain is experienced on the stimulation of these nerves, for the agitation of the animal may not be due to pain.

Third, it is a well-known fact that the spontaneous and objective pain is often not at the seat of the lesion. Sometimes this has an anatomical basis, as when the pain of perforated duodenal ulcer is felt in the right iliac fossa, because the contents of the bowel gravitates to that region and sets up local irritation.¹ In other cases, no explanation can be given upon anatomical grounds, as when the pain and tenderness in appendicitis occur in the epigastrium or upon the left side and not in the right iliac fossa at all. Another instance of this is when pain and tenderness occur in the epigastrium in cases of ulcer in a displaced stomach. Then the pain and tenderness are where one would expect them to be, if the stomach was in place, not where the ulcer really is.² Still another example is the varied distribution of pain in cholecystitis.

Mackenzie³ has elaborated the work of Hilton, Ross, and Head and has supplemented it with results of his own long clinical and experimental observations. If we accept his views, we are enabled to come much nearer the true conception of the causes and manner of abdominal pain than it has been possible for us to do heretofore. While I think that some of Mackenzie's axioms need further investigation and proof, still, his article is very suggestive.

¹ PROGRESSIVE MEDICINE, December, 1904.

² *Ibid.*, December, 1905.

³ Brit. Med. Jour., June 23 and 30, 1906

INSENSITIVENESS OF THE VISCERA TO ORDINARY STIMULI. Mackenzie says: "When all the facts concerning visceral pain are taken into consideration, it will be found that the usual conception of the manner in which pain is conveyed to the mind fails to explain the phenomena connected with the recognition of pain when it is due to affections of the viscera. To begin with, the viscera are insensitive to those stimuli which produce pain when applied to the external body wall. The visceral tissues can be cut, torn, and burnt, and the individual remain unconscious of any sensation. Nevertheless, we all know that the viscera are capable of giving rise to pain of the most excruciating character, so that the reason the methods employed to produce pain in stimulating the external body will fail to produce visceral pain is manifestly that the stimuli are inadequate; and from this fact alone we are forced to conclude that a satisfactory explanation of how visceral pain arises has yet to be found."

SENSITIVE TISSUES OF THE EXTERNAL BODY WALL. In order to understand the morbid physiology of visceral pain it is necessary to comprehend more fully the sensibility of the tissues forming the external body wall. How profoundly ignorant we are of this subject has recently been shown by the investigations of Head and his colleagues.

We find in the abdominal wall three layers endowed with exquisite sensibility to pain. The first of these, the skin, need not be dwelt upon, save to point out how its sensibility becomes increased in visceral disease, and how this increased sensitiveness is united to an exalted muscular reflex. The second of these sensitive layers is formed by the flat muscles of the abdomen and is the most important, and the one most commonly affected in visceral disease, its sensibility being very readily increased. Muscular hyperalgesia is such a striking phenomenon, is so frequently present, and plays such an important part in the protective mechanism, that it is astonishing to find it almost universally overlooked. One can read elaborate treatises devoted to special organs in which this symptom is the most striking and the most instructive feature, but its presence is nevertheless overlooked or misinterpreted. If anyone will take an ordinary case of stomach ulcer, appendicitis, gallstone, or renal colic, or enlarged liver, and note the tenderness of the abdominal wall and observe how this deep tenderness extends far beyond the site of the organ affected, they will begin to appreciate the nature and significance of this symptom. With a little care one will be able to distinguish these symptoms from cutaneous hyperalgesia and from hyperalgesia of the deeper tissues. The third sensitive layer is one of which anatomists and physiologists were quite ignorant when Mackenzie discovered it clinically. It is the layer of loose connective tissue lying immediately outside the peritoneum. He suspected its presence for a long time as he frequently could get exquisite tenderness in pushing his fingers between the recti muscles; for instance,

in cases of gastric ulcer, the stomach not being affected by the pressure. Its demonstration occurred first in a case of operation for the radical cure of hernia by Caird, who had injected cocaine in the site of the incision. The skin and muscles were cut through and the patient experienced no pain. When Caird gently tore through the loose connective tissue the patient experienced most exquisite pain. After the peritoneum was exposed it was incised and afterward stitched and the patient felt no pain. This observation Mackenzie has verified on several occasions. He consulted several anatomists but found they had no knowledge of any nerve distribution in this region. Subsequently Ramstrom made a careful histological examination of the abdominal wall of the man and other mammals and showed that this region was richly endowed with nerves and nerve endings, the nerves being derived from those which supply the muscles of the belly wall.

This observation may probably afford a clue to the confused statements that exist in regard to the sensitiveness of the peritoneum. Mackenzie has on numerous occasions in the course of operations scratched and cut the serous surface of the peritoneum on conscious subjects, and has never known the slightest sensation elicited. One can understand, however, that the inflamed peritoneum would readily affect this remarkable nervous layer. Peritonitis, however, so readily produces muscular hyperalgesia and tonic muscular contractions (visceromuscular reflex) that the pain and tenderness are demonstrably, in the majority of cases, of spinal origin.

With the recognition of these sensitive structures—frequently rendered exquisitely sensitive to painful stimuli in visceral disease—it will be understood how impossible it is to judge of the sensitiveness of the viscera by external exploration. When, therefore, we find the surgeon or physician demonstrating the sensitiveness of any viscus, it will be realized that he is in reality stimulating, in his examination, those extremely sensitive structures of the external abdominal wall, and referring the pain he elicits to an organ that is totally insensitive to any such stimulation.

It is a curious fact that although the belief is so universally held that the viscera are endowed with (sensory) nerves, and that physiologists refer to afferent sympathetic nerves as sensory in function, not a single authentic observation has been rendered in proof of these assertions. Of course, a great deal depends upon what is considered evidence, many people being perfectly satisfied if they elicit pain by pressing over an organ. Physiologists have interpreted certain movements as an expression of pain after electrically stimulating an afferent sympathetic nerve. But this does not prove that pain was evoked, nor does it prove in what situation the pain was felt—for the location of the pain is the key to the problem.

THE PAIN OF COLIC. This subject of the mechanism of the pain in colic has been the subject of much controversy in German literature during the past two years. The leader in the discussion was Nothmager.¹ He said that colic pains originate in the wall of the viscus itself. He stated that because the bowel wall is not sensitive to ordinary stimuli there is no proof that pain cannot be produced if the proper sort of stimulation is applied, and that in the cases of colic the pain is produced in the wall of the gut by tetanic contraction of the wall which produces a local anemia and this in turn causes pain which is carried by the sensory fibers of the sympathetic nerves. This applies of course to the bile ducts and appendix and to any hollow viscus.

THE RELATIONSHIP OF THE SITE OF PAIN TO THE SITE OF THE LESION. For many years Mackenzie has kept notes of the position in which pain was felt in a great variety of diseases, and in course of time has been able to identify the exact site of the lesion in cases that come to operation, or to *postmortem* examination. The conclusion arrived at from the consideration of these cases was that the situation of the pain did not as a rule directly afford any clue to the situation of the lesion, but when the situation of the pain was immediately over the lesion, other evidences showed that the pain was not felt in the organ, but referred to the sensory nerves in the external body wall.

THE MECHANISM BY WHICH PAIN IS PRODUCED IN VISCERAL DISEASE. When a nerve that terminates in a sense organ is stimulated in any part of its course from the periphery to the brain, a stimulation is given to the brain of a kind similar to what would have happened if the peripheral end-organ had been stimulated.

If, however, a morbid process in a viscus gives rise to an increased stimulus of the nerves passing from the viscus to the spinal cord, this increased stimulation affects neighboring centres, and so stimulates sensory, motor, and other nerves that issue from this part of the cord. Such stimulation of a sensory nerve will result in the production of pain referred to the peripheral distribution of the nerve whose spinal centre is stimulated, so that visceral pain is really a viscerosensory reflex. If the increased stimulus affects a motor centre, then a contraction of the skeletal muscle results, and thus is produced the visceromotor reflex.

The reasons why the pain is referred to portions of the body so far apart is because in the course of development the tissues that in a low scale of life immediately covered the organ have been displaced. Thus, the pain felt in the testicle in renal colic is due to the fact that in its journey down to the scrotum the coverings of the testicle receive a twig from the first lumbar nerve, and when the root of this nerve is stimulated, as in renal colic, the pain radiates to the testicle. In renal colic one never

¹ Arch. f. Verdauungskrank., 1905, Band xi, Heft 2, p. 117.

finds the skin of the scrotum hyperalgesic, but always the deep covering of the testicle, because the scrotum is supplied by the sacral nerves.

RADIATION OF PAIN. Perhaps the best evidence to be found as to the true nature of visceral pain is to observe the manner in which pain spreads. No attempt is ever made by writers to appreciate the meaning and significance of the spreading of pain. Thus the pain of an inflamed gall-bladder is often described as being "diffused over a large area along and below the margin of the liver." In what tissues was this widely diffused pain felt? If the pain were in the gall-bladder, how comes it that it was felt in a region more extensive than that occupied by the gall-bladder?

The diffusion of pain over a wider area than that occupied by the lesion originating the pain can be proved in many ways to be due to an extension of the irritation affecting the roots of sensory nerves in the spinal cord. Thus the extension of the painful area is frequently associated with hyperalgesia of the tissues of the external body wall. The pain is often found to radiate along peculiar areas, inexplicable unless we recognize the relationship in the spinal cord of the nerves supplying these areas, as, for instance, when the pain of angina pectoris passes from the front of the chest into the axilla and down the arm—that is to say, into areas supplied by continuous nerve roots (third, second, and first dorsal nerves); or the pain may appear at a distance from the affected organ and gradually approach it until the pain is felt in the tissues covering the organ, as when in angina pectoris the pain may at first be confined to the arm, but with increasing severity radiates to the front of the chest.

THE SIGNIFICANCE OF PAIN OVER MCBURNEY'S POINT. Kelling¹ reaches the same conclusion as Mackenzie as to the danger of interpreting hypersensitiveness of the abdominal wall as pain originating in the viscera themselves. His observations as to the meaning of pain over McBurney's point are interesting.

He shows that McBurney's point is a portion of the abdominal wall where the cutaneous nerves pierce the fascia to come to the surface. It is, therefore, a point to which pain is very likely to be referred. As is well known, it often does not correspond anatomically to the position of the appendix. Therefore, the frequency of subjective pain and tenderness in this area in disease of the appendix must be reflex. So also the occurrence of pain from McBurney's point in disease of the gall-bladder and gall ducts, to which Kelling refers, can be explained on the same theory.

The whole discussion is more or less academic and is only partially based on experimental evidence. However, it seems to be well established that the production of abdominal pain is very much more complex than we have thought. New evidence is accumulating all the time and soon

¹ Arch. f. Verdauungskrankheit., 1905, xi, pp. 550.

we will be able to clearly understand the production of visceral pain, and when we can do that, then the symptom will be very much more valuable than it is at present.

The clinical lesson to be drawn from the work of Mackenzie, Kelling, Nothnagel, and the rest is, that while pain is always a danger signal we must not be misled by its distribution. In inflammation of the various organs, it seems almost certain that the pain does not originate in the affected organ, but is projected to a point in the sympathetic system (Kelling) or the abdominal wall (Mackenzie) which is not necessarily directly over the lesion. The distribution without doubt follows some definite law which is as yet not thoroughly understood. Therefore, we must treat the disturbance of sensation as an indication of trouble, and if it does not correspond in position to the point where our other clinical symptoms indicate that the trouble lies, then we must not be thrown off the track by the position of the tenderness of the spontaneous pain.

THE LIVER.

The Nature of Cirrhosis of the Liver. One of the most complete articles upon this subject is that by A. O. J. Kelly,¹ in which he combines the results of the study of a series of cases of his own with a critical summary of recent work by MacCallum,² Bostroem,³ Pearce,⁴ Kretz, and others.

Kelly's conclusions are as follows: 1. The most noteworthy pathological feature of cirrhosis is the complete rearrangement of the architecture of the liver parenchyma. In order to understand this, we must remember, as Kelly points out, that the structure of the liver is quite different from what most of us were taught. The physiological unit is not the more or less round acinus, but is to be described more as a cylinder of liver cells around the central or hepatic vein. As the vein ramifies so do these cylinders of cells. But as the columns are cut across, they appear more or less round, hence the old idea that they were globes and not cylinders.

2. The rearrangement of cells and of the architecture of the liver are due to two processes: (a) The destruction of the cells from some poison (including the known causes of cirrhosis), and (b) the regeneration of the liver cells which takes place to a surprising extent. The liver in cirrhosis consists, then, not only of remnants of the original parenchyma, but also (and in large part) of regenerated liver tissue. This destruction

¹ Amer. Jour. Med. Sci., December, 1905.

² Jour. Amer. Med. Assoc., 1904, vol. xliii, p. 649.

³ Deut. med. Woch., 1905, xxxi, p. 167.

⁴ Jour. Exper. Med., 1906, vol. viii, No. 1.

and rebuilding is what distorts the typical architecture and destroys the normal relation of the cells to the central veins.

3. There is no secondary atrophy of the liver cells from pressure. This is seen by the good conditions of the cells that lie on the outside of the lobule next to the connective tissue. For this and other reasons we may suppose that the growth of connective tissue is secondary to cell destruction; that is, the fibrous tissue proliferates to take the place of destroyed cells and the process is not a primary growth of connective tissue.

When the poison that is responsible for the cirrhotic process continues to enter the liver it leads to a continuous death of old as well as the newly formed liver cells. This is in turn followed by replacement of the dead cells, partly by connective tissue, and partly by new liver cells. Thus the histological picture shows an increase of connective tissue and also a recrudescence of the remaining liver cells. This continuous degeneration and regeneration in time leads to a complete transformation of the architecture of the liver. Ultimately the power of regeneration of the cells gradually lessens and is lost, the connective tissue predominates, the degenerative changes are more prominent than the regenerative ones, the results of portal obstruction become more pronounced, and the functioning power of the liver diminishes. The result is the clinical picture that we see in the last stages of cirrhosis.

The extraordinary power of regeneration that the liver displays, especially in the early stages of the process, offers the hope that cirrhosis may be more amenable to treatment than we have supposed, provided the poison that is causing the cell destruction can be discovered and its entrance into the liver stopped. In this fact lies the great therapeutic possibilities of this conception of cirrhosis.

There are many difficulties in the way of a satisfactory clinical classification of cirrhosis, but pathologically all varieties are but different forms and stages of the same process. As Kelly says, we should attempt to discountenance as far as possible the use of the terms *atrophic* and *hypertrophic*, since a large liver may be atrophic to a marked degree and hypertrophy of the liver cells is a conspicuous feature of all small livers.

The Hemorrhagic Form of Cirrhosis. This is merely an attempt by Aldor¹ to make a new clinical variety of cirrhosis based upon the early occurrence and serious type of hemorrhage from the gastrointestinal tract. The desirability of such refinements of classification is doubtful. The diagnosis in such cases is of course interesting, for the source of the bleeding is often obscure. A special feature of such cases as noted by Aldor is the marked enlargement of the spleen.

¹ Berl. klin. Woch., 1905, xlii, No. 35.

Changes in the Spleen in Cirrhosis. It is a well-known clinical fact that the spleen is enlarged and firmer than normal in a great many cases both of cirrhosis and of chronic passive congestion of the liver.

Christian¹ explains the enlargement by finding an increase in the connective-tissue framework of the spleen. In thirty-eight cases of chronic passive congestion and cirrhosis, the spleen of twenty-eight (73.6 per cent.) showed this fibrosis. That the increased firmness is not due alone to increase in connective tissue is indicated by the fact that in the remaining ten cases the spleen was very hard and yet there was no fibrosis. Christian explains this by assuming that the firm consistence was due to vascular distention, and says that this last condition probably plays an important part in increasing the density of the organ when there is an increase in the connective tissue as well.

Changes in the Pancreas in Cirrhosis of the Liver. Lando² has studied twenty-three cases of cirrhosis with autopsy in order to determine the condition of the pancreas. He finds that there is a more or less marked increase in the connective tissue of this organ in all cases of cirrhosis. Often, too, the ducts are dilated as if there were some interference with the outflow of the secretion of the gland. It is possible that these changes are due primarily to alcoholism, just as the cirrhosis itself, but in a certain number it seems probable that they are secondary to the changes in the liver. The type of the fibrosis is the intralobular form. When pigimentary changes occur in cirrhosis of the liver they occur also in the pancreas. The islands of Langerhans were involved in almost all cases, but there was no diabetes in any of them. This may be due to the fact that the degeneration of these bodies was not very marked.

Obliterating Endophlebitis of the Hepatic Veins. This subject was brought into prominent notice by Chiari in 1899, although it had been noted by Budd as early as 1846. Chiari reported five cases and since that time has seen two more. This contrasts very markedly with the fact that Hess,³ the most recent writer upon the subject, has been able to collect but twenty-three cases, and suggests that the condition is more frequent than the number of collected cases indicate. Chiari finds more cases than do others, because he examines the orifices of the hepatic veins routinely while other pathologists do not.

Hess writes from Chiari's Pathological Institute in Prague, and his article is the first complete and systematic one in American literature which indeed contains no reported instances of the disease. Since obstruction of the hepatic veins will dam up the portal system the clinical picture of the condition is that of portal obstruction. There is ascites,

¹ Jour. Amer. Med. Assoc., November 25, 1905.

² Ztschr. f. Heilkunde, xxvii, 1, 1906.

³ Amer. Jour. Med. Sci., December, 1905.

dilated abdominal veins, sometimes a caput medusæ, very slight or no icterus, a palpable liver in the early stages, and a palpable spleen. What then are the points in the differential diagnosis between cirrhosis and obliterating thrombosis of the hepatic vein?

1. The occurrence of pain over the hepatic region or upper abdomen is common in endophlebitis but rare in cirrhosis.

2. The rapidity with which the swelling of the liver and ascites develops. In endophlebitis the patient will often say that the swelling of the abdomen has showed itself within a few weeks or even a few days; whereas, in cirrhosis the onset of both conditions is very gradual. Later in the course of the disease the rapidity with which the fluid develops and the frequent necessity of paracentesis point to an essentially obstructive lesion.

3. The absence of the usual causes for cirrhosis and the age of the patient are important points in the diagnosis; for endophlebitis often occurs in young persons—quite often in children—twice under two years in Hess' list. Whereas cirrhosis is a disease of middle life. In a case resembling ordinary cirrhosis, but occurring in a young individual in whom the ordinary causes of cirrhosis are absent, we should suspect endophlebitis.

4. All of these symptoms, however, although brought about by hepatic disease, are directly dependent upon the secondary obstruction in the portal system and are typical of portal obstruction. We cannot distinguish between them, and it is only the lack of a cause for portal obstruction that should make us consider whether this condition is not the result of a primary hepatic obstruction.

5. Males and females are about equally affected. The onset is gradual and in most cases runs over several years, although fulminating cases have occurred which were mistaken for poisoning or intestinal obstruction.

However, when all is said, the diagnosis must always be difficult. Indeed, according to Hess it has never been made *intra vitam*. The etiology of the endophlebitis is obscure. In two of Chiari's cases there was evidence of syphilis, and this is probably an etiological factor in many cases. Indeed, all but one observer of those who believed inflammation to be the basis of the disease ascribed the changes to syphilis, but Hess says in most of them sufficient pathological or clinical evidence to warrant a diagnosis of syphilis was wanting.

A Very Sensitive Reaction for Biliary Coloring Matter. A. Krokiewicz¹ describes a reaction for biliary pigment, applicable to urine or any other fluid. Three reagents are necessary:

¹ Münch. med. Woch., 1906, No. 11, p. 496.

A. 1 per cent. solution of sulphanilic acid in distilled water.

B. 1 per cent. solution of sodium nitrite in distilled water.

C. Pure concentrated hydrochloric acid.

A and B must be kept in dark bottles. At the time of the test they are mixed in equal proportions. A few drops of the mixture are placed in a test-tube, and an equal quantity of the fluid to be tested is added. The tube is well shaken for a few seconds, the contents assuming a ruby red color. One or two drops of solution C are added, and the whole is considerably diluted with distilled water. The solution thereupon assumes an amethyst color in the presence of bilirubin or little oxidized bile pigments. The reaction never occurs in the urine after the internal administration of chrysophanic acid, santonin, copaiba, tannin, anti-pyrin, phenacetin, naphthol, salicylates, salol, iodine, bromine, and quinine. It does not depend upon the presence of indican in the urine, nor upon those factors which produce the diazo reaction. It occurs very readily in a 1 to 500 dilution of bile, and is more sensitive than any previously described test.

Compression of the Bile Ducts by a Tuberculous Gland. An instance of this rather rare condition is reported by Lenoble and Attila.¹ A man, aged thirty years, was admitted into the hospital with fever and gastric irritation. He had been long under treatment for pulmonary phthisis, and there were cavities at both apices. Two days after admission the temperature fell and general jaundice was observed; the urine became so dark as to appear as though it contained blood as well as bile. Icterus gravis was suspected, but the physical signs in the thorax and the profuse sweats showed that acute phthisis was the primary complaint. There was sharp pain in the right hypochondrium, and the liver was enlarged and continued to swell. Compression of the ducts was, therefore, suspected. The patient died about a fortnight after admission. The jaundice had in the interval become intense. The lower parts of the lungs were found full of recent miliary tubercles, while the upper parts were riddled with cavities and adherent to the pleura. The common duct was pressed upon and obstructed by several tuberculous lymph nodes.

Bronchobiliary Fistula. F. Eichler² has collected thirteen cases of fistulous openings between the biliary tract and a bronchus. With the exception of one case, in which the abnormal communication was caused by a trauma, all of the cases could be traced to gallstone disease as the etiological factor. The gallstones gave rise to circumscribed hepatic abscesses, with secondary rupture into the pulmonary parenchyma. In all cases the expectoration of sputum containing bile was preceded by the

¹ Bull. et Mém. de la Soc. Anat. de Paris, November, 1905, p. 781, and Brit. Med. Jour., Epitome, 1906, i, No. 364.

² Berl. klin. Woch., Ewald Fest-Nummer, October 30, 1905, p. 97.

development of violent paroxysmal pains in the right upper quadrant of the abdomen. These pains were usually accompanied by a rise in temperature. Jaundice was present in seven cases. In some cases the pains were present only in the first stages of the disease. The absence of both pain and jaundice is illustrated in a case reported by Dreschfeld. In 1897, Graham published an account of a case, in which the expectoration of bile lasted two weeks and then suddenly stopped. The patient enjoyed good health for ten years, and then a cough and biliary expectoration again set in.

The case reported by the author is also of this nature. The patient, a man of forty-three years, had an attack of cough with biliary expectoration at the age of twenty-three. The attack came on without any apparent cause, lasted about five or six months, and then gradually subsided. There was no pain or febrile disturbance. Twenty years later the condition started again, also without fever or pain. The bowel movements were light in color, but there was no jaundice. As the patient was rapidly losing in weight and strength, an operation was decided upon. The patient died, and at autopsy there was found a fistulous communication between a bronchiectatic cavity in the right lung and a large biliary passage in the right lobe of the liver. Two small calculi were found in the right hepatic duct. The author believes that the fistula resulted from the perforation of a calculus into a bronchus, after inflammatory adhesions had been formed between the liver and diaphragm, and later between the diaphragm and right lung. The cessation of symptoms may be attributed to an attempt at closure of the fistula, which was opened again by means of stagnation of bile in the natural passages.

Experimental Work upon the Treatment of Cholelithiasis. William Bain¹ has published some very interesting work upon the causation and treatment of gallstones. His results show in brief that when gallstones are placed in the healthy gall-bladder of dogs they disappear in about six weeks; while if a culture of bacilli coli communis is injected into the bladder and at the same time its walls are scraped so as to produce an infectious cholecystitis then the stones do not dissolve. This is in accord of our ideas of gallstone formation, namely, that inflammation of the gall-bladder is an important factor in the formation of calculi. Bain remarks truly that this should teach us to try and find some method of rendering the gall-bladder aseptic and healthy instead of trying to dissolve the stones *in situ* by giving solvents which act upon the stones in experiments outside of the body. The therapeutic observations of Bain's are not nearly as convincing as the rest of his work. Ichthoform, cholelysin, olive oil, and calomel had no effect upon the stones. A mixture of

¹ Brit. Med. Jour., August 5, 1905.

urotropin and iridin had quite a marked effect in two cases, and Harrogate old sulphur water also appeared to hasten the solution of the stones in two cases. In order to present Bain's views fairly, I append the following table:

TABLE SHOWING THE CHIEF DETAILS OF THE EXPERIMENTS.

No.	Weight of dog.	Weight of stones before insertion.	Weight of stones at death.	Substance given.	No. of days alive after operation.	Condition of gall bladder postmortem.
	Kilos.	Mg.				
1	7½	1,700	Disappeared,	Nothing	66	Healthy
2	7¾	1,640	Fragments, 400 mg.	"	38	"
3	6½	1,750	Residue unweighable	"	63	"
4	16¾	1,425	835 mg.	Control	62	Inflamed
5	5½	957	510 mg.	"	56	"
6	20½	1,220	920 mg.	"	14	"
7	7½	1,458	Fragments, 140 mg.	Sulphur water	54	"
8	8½	1,570	970 mg.	Olive oil	61	"
9	18½	1,590	750 mg.	"	63	"
10	7	1,705	Fragments, 400 mg.	Sulphur water	70	"
11	9¾	2,600	1,422 mg.	Ichthoform	63	"
12	17	2,792	640 mg.	Urotropin and iridin	63	"
13	10¾	2,608	2,186 mg.	Cholelysin	56	"
14	6	935	485 mg.	Calomel	58	"
15	10	1,690	Disappeared	Urotropin and iridin	60	"
16	12½	2,090	Fragments, 660 mg.	Barium chloride	60	"

It must be remembered, as Bain remarks himself, that the cholecystitis produced in the dog was mild, had not lasted a long time, and was not accompanied by obstruction of the ducts. When we deal with a firmly established cholecystitis and cholangitis due to obstruction, I doubt very much whether anything can restore the gall-bladder to a comparatively normal condition, except drainage, even if the obstruction has removed itself spontaneously. The results of the administration of the biliary antiseptics, menthol and salicylic acid, as suggested by Kuhn,¹ which seemed theoretically most promising, do not work well in old and established cases of cholelithiasis, as I have found in my own experience. Besides, who can say definitely whether an obstruction exists or not? When all is considered I am inclined to believe that the best method of obtaining asepsis and a healthy mucous membrane in the gall-bladder is by opening it, removing the stones whether in the bladder or ducts, and then draining the bladder itself. This does not belittle Bain's work, for he has shown what we most wish to know in these cases, namely, that when we get the gall-bladder in a healthy condition no more stones will form.

Pancreatitis and Cholelithiasis. It is needless to say that the relation between cholelithiasis and pancreatitis is very intimate and important.

¹ PROGRESSIVE MEDICINE, December, 1905, p. 105.

We would not be far wrong if we said that cholelithiasis cannot last for any length of time without involving the pancreas.

Quénu and Duval¹ report 4 cases of pancreatitis associated with gall-stones, and make a study of the condition. They collected 118 cases of pancreatic inflammation, in which there were calculi in the gall-bladder or cystic duct in 46 cases, in the common duct in 20 cases, in the ampulla of Vater in 8, and in the duodenum near the ampulla in 2. In 28 cases they occupied the whole biliary tract (gall-bladder, cystic duct, and common bile duct), in 11 cases the location of the calculus was not determined, and in 3 cases they were found in the stools.

Pancreatitis was more commonly associated with stone in the common duct than with those in the gall-bladder. Chronic pancreatitis was also most frequently associated with stone in the common duct, next with gall-bladder stones; suppurative pancreatitis with stone in the gall-bladder; and hemorrhagic pancreatitis with stone in the ampulla of Vater.

In most of the cases the biliary lithiasis has been long present. All varieties of pancreatitis have been observed in the course of biliary lithiasis, namely, the acute form, intraglandular hemorrhage, localized necrosis or suppuration, peripancreatic abscess, and chronic pancreatitis.

The writers recognize two modes of infection: (1) By contiguity from the common duct; (2) by ascending infection along the bile ducts, duodenal or biliary in origin. A biliary calculus can, by ulceration, directly invade the head of the pancreas. Obstruction of the pancreatic duct with retention is an additional factor in the production of pancreatitis.

The symptomatology of pancreatitis associated with cholelithiasis is still little known. Setting aside the cases of grave acute pancreatitis, of which the symptomatology is clear, the symptoms of chronic pancreatitis are lost in the hepatic syndrome, and we must recognize that in almost all cases the diagnosis of this variety is made at operation. The acute type is recognized by its suddenness and its immediate gravity. Its fulminating onset occurs either during the painful biliary crises or during a period of calm.

It becomes necessary in cases of chronic pancreatitis associated with biliary lithiasis to seek for a special symptom or shade of meaning in the hepatic syndrome which will permit the diagnosis of the pancreatitis.

Kinnicutt reported a case in which the patient found successively in his stools phosphatic calculi which were of pancreatic origin, those of hepatic origin consisting of cholesterin. A study of the reported cases permits one to say that in a general way when biliary lithiasis accompanies pancreatitis, the hepatic syndrome is not regular, the hepatic

¹ *Rev. de Chir.*, October, 1905, vol. xxxii, p. 401, and *Amer. Jour. Med. Sci.*, 1906, vol. cxxxi, p. 903.

crisis does not clear up, and it is abnormal in certain details. The location and character of the pain will be somewhat different. The point of greatest tenderness is not over the gall-bladder, but above the umbilicus in the epigastric region. Vomiting will be more frequent than in simple cholelithiasis. We see, therefore, that only certain details in the general symptoms can be attributed to the pancreas. Since the swelling of the pancreatitis is almost always in the head, this can easily be confused with the distention of the gall-bladder. When the pancreatitis is associated with cholelithiasis, the condition of the gall-bladder is always the same as in isolated cholelithiasis; that is, small and contracted. The emaciation in grave pancreatitis is not more grave than in old chronic jaundice from cholelithiasis. Pancreatic glycosuria is rare. Jaundice from a calculus in the common duct is more frank and more continuous; that due to pancreatitis is less pronounced and varies in intensity.

The writers believe that the best treatment for acute pancreatitis is drainage of the pancreas combined with drainage of the biliary tract, the seat of the drainage in the latter (gall-bladder or common bile duct) being determined by the seat of the calculus. The treatment of chronic pancreatitis with cholelithiasis is indirect and consists in removing all the calculi and draining the biliary passages. The intrapancreatic portion of the common bile-duct must be especially explored, because calculi are frequently overlooked in that portion.

THE MECHANISM OF THE PRODUCTION OF PANCREATITIS IN CHOLELITHIASIS. Opie has already shown that many cases of acute hemorrhagic pancreatitis are due to the diversion of the bile into the pancreatic duct. The pancreatitis associated with chronic cholelithiasis is probably due to the same process.

Flexner¹ now attempts to show in what way the bile is responsible for this toxic action.

It is known that biliary salts have a decided cytolytic action on many kinds of cells, such as blood corpuscles, muscle, nerve, epithelial, and liver cells. When a solution of sodium taurocholate was injected into the pancreatic duct of dogs a typical acute hemorrhagic pancreatitis was produced which proved fatal in a few hours. When the salt was suspended in a colloidal solution with gelatin or agar, so that its action was not so rapid or violent, a subacute inflammation leading to sclerosis was produced instead.

The work of Flexner seems to prove almost conclusively that the pancreatitis of cholelithiasis is due to the entrance of bile into the pancreatic duct in colloidal solution. The inflammatory changes that take place in the gall-bladder and ducts in gallstone disease cause changes in the

¹ Jour. Exper. Med., January 25, 1906, vol. viii.

composition of the bile. The mucus and albumin which are present under these conditions furnish exactly the conditions under which we would expect the bile salts to produce a chronic pancreatitis, namely, a colloidal solution.

THE PANCREAS.

The Stools in Disease of the Pancreas. STEATORRHEA IN PANCREATIC DISEASE. When Claude Bernard published his paper upon the *Stools of Pancreatic Disease*, in 1857, he made such a profound impression upon medical thought that it is probable that steatorrhea and especially neutral fat in the stools is still pretty generally considered a pathognomonic symptom of lesions of the pancreas. Bernard stated from experimental observations that the pancreatic juice had the following functions: (1) Cleavage of neutral fats; (2) emulsification of fats; (3) promotion of absorption of fat through the intestinal wall. Since Bernard's work appeared, very numerous observations, experimental and clinical, have been made, sometimes confirming but oftener contradicting him. One reason for the confusion was that very many of the cases of pancreatic disease had also complete closure of the bile ducts and observations were made concerning pancreatic stools without taking into consideration the fact (then unknown) that the bile had a very great influence upon fat absorption. Another reason was that the observations were not accurate experiments in metabolism. Oser gives in his article in Nothnagel's system the status of the question of steatorrhea in pancreatic disease up to the present year as follows: There is usually disturbance of fat digestion and absorption in disease of the pancreas even when there is no jaundice and no disease of the intestine; but, on the other hand, steatorrhea alone gives no definite evidence of pancreatic disease.

Oser says at the time he wrote that it could not be definitely stated to what extent the disturbance of cleavage of fats may be used as a symptom of pancreatic disease, although it is certain that fat-splitting is one of the pancreatic functions. In other words, when Oser wrote, the examination of the stools gave no help in the differential diagnosis of pancreatic disease. Enough evidence had been produced to show that the one condition in the stool that had been considered a very important symptom of pancreatic disease, namely, the presence of neutral unsplit fat, while an important sign of very serious pancreatic disease, might occur with other conditions and did not always occur when the pancreas was affected.

In PROGRESSIVE MEDICINE for December, 1905, I referred to a paper by Ury and Alexander in which they confirmed this last statement that pancreatic disease may exist with normal splitting. A very impor-

tant and interesting paper by Brugsch¹ from Umber's clinic in Altoona has recently appeared, which seems to bring a little order into all this confusion. Brugsch has carried out a series of experiments upon animals and has made a number of clinical observations in an attempt to determine whether accurate metabolic observations upon the feces can help to detect the types of pancreatic disease that depart from our received clinical picture of that condition. He disregards, as we can, those cases in which the clinical picture is almost certain, namely, those with liquid fat in the stools, especially when it is passed just after a stool, with mild diabetes, or alimentary glycosuria and with a palpable epigastric tumor.

Brugsch is trying to do for the pancreas what is being attempted in the diagnosis of all forms of abdominal disease, namely, discover a method of diagnosis that will be effective early enough to promise relief by treatment either medical or surgical. According to Brugsch's investigation, degenerative processes in the pancreas both acute and chronic as a rule interfere with fat absorption, and so fatty stools are an important, though not a pathognomonic, symptom of pancreatic disease. However, his results appear to show quite conclusively that deficient fat-splitting is not a reliable sign of pancreatic disease, and indeed that fat-splitting is not affected by suppression of the pancreatic secretion. This contradicts many previous statements upon this point, but it has been definitely proven experimentally and clinically by other observers, as well as by Brugsch, that normal splitting of fat may exist when the pancreatic secretion is entirely absent from the intestine.

THE AVERAGE FAT LOSS IN PANCREATIC DISEASE WITH AND WITHOUT JAUNDICE. Brugsch's investigation consists of a number of experiments upon animals and clinical observation. He found that the experimental work entirely confirmed the clinical, and this part of his work does not require especial mention. According to the observations of Brugsch, Müller, and others the normal fat loss is 10 per cent. or under of the injected fat. He finds from his own investigation that the fat loss is as follows in pancreatic disease: Fat loss in pancreatic disease without jaundice, 64.6 per cent.; fat loss in pancreatic disease with slight jaundice (incomplete closure of ducts), 72.2 per cent.; fat loss in pancreatic disease with total stoppage of bile, 87 per cent. Comparing his results with other reliable investigations, he concludes that the average fat loss in serious pancreatic disease without jaundice is about 50 to 60 per cent. After a study of cases of jaundice without pancreatic disease he concludes that when bile is absent from the intestine the fat loss averages 45 per cent. Freidrich Müller places it higher, namely, 67.6 per cent.; but as Brugsch says, it seems probable that there was some intestinal

¹ Ztschr. f. klin. Med., 1906, Band lviii, p. 518.

disorder in Müller's cases in addition to the jaundice which would influence the fat absorption. Of course, when both jaundice and pancreatic disease are present together the fat loss reaches a higher figure than in either one alone. Brugsch formulates the following clinical rule from these observations, namely, if in a case of jaundice the fat loss is under 60 per cent. concomitant disease of the pancreas can be excluded but if the loss is 80 to 90 per cent., an associated pancreatic lesion is probable. Lesser grades of pancreatitis will cause less interference with fat absorption, and in several clinical and experimental observations Brugsch shows that the fat loss in these conditions is considerable, but always under 50 per cent.

STEATORRHEA IN CONDITIONS NOT PANCREATIC DISEASE. However, the detection of minor grades of pancreatic disease by laboratory methods is an almost impossible task. All of our tests for pancreatic disease are of value in detecting total lesion of the pancreas only, and as a rule fail to show the lesser grades of disease. Thus the statement of Brugsch that partial disease of the pancreas causes increased fat loss of lesser degree than serious lesions is offset by the fact that various intestinal lesions may, of course, cause decrease of fat absorption. Such fatty stools are seen in tuberculous peritonitis and in fermentative colitis in children (without diarrhea), in ascaris disease, and so on. In increased peristalsis from any cause fat absorption may be interfered with.

I have seen two striking examples of very fat stools in ascaris disease and chronic intestinal indigestion of children in which there was no jaundice and in which the subsequent course of the disease excluded disease of the pancreas. As a rule, such fatty stools can be correctly interpreted by help of the other clinical symptoms, and no confusion should arise; but when disturbance of fat absorption of intestinal origin is added to jaundice, the fat loss in the two combined conditions may be so high as to lead to error. One point that may aid in distinguishing the fat stools of intestinal trouble from those of pancreatic disease is the fact that, as Brugsch points out, the stools in pancreatic disease contain but little soap as compared with fatty acids, while in my experience at least the fat stool in intestinal disorders consists almost entirely of soap.

FAT-SPLITTING IN PANCREATIC DISEASE. Disturbance of fat-splitting has been generally considered an important symptom of pancreatic disease since the time of Freiderich Müller. However, Abelman and Deucher have shown that the pancreatic secretion may be entirely cut off without disturbance of fat-splitting. Brugsch tabulates fifteen cases in which the amount of fat-splitting has been carefully studied. This table shows very clearly that diminished splitting is not pathognomonic of pancreatic disease, and that no data of definite diagnostic value can be derived from a study of the relation of neutral fats to fatty acids and soaps. It will be

seen from this table that other conditions besides pancreatic disease may show a percentage of neutral (unsplit fat) above normal, and, on the other hand, pancreatic disease can exist with good splitting and a small per cent. of neutral fats. As Brugsch says, if he had based his diagnosis upon the per cent. of neutral fat in some of these cases he would have been greatly deceived.

If fat-splitting is a function of the pancreas we must assume from these observations that some other secretion has the same function and can largely take the place of the pancreatic secretion when the latter is suppressed. We know that a fat-splitting ferment has lately been discovered in the stomach; and Deucher has shown that the *success entericus* has some such power. Freidrich Müller has also shown that as much as 14.7 per cent. of the ingested fat can be split by the action of the intestinal bacteria.

All this indicates that there are fat-splitting ferments besides those contained in the pancreatic juice which are capable of assuming the fat digesting work of the pancreas when the latter is destroyed. Umber¹ has attempted to determine where this power lies. He says that it is unlikely that it is in the bile alone, because fat-splitting may be normal when no bile is entering the intestine. It is also unlikely that the fat-splitting ferment in the gastric secretions, or the moderate power possessed by the intestinal bacteria for splitting fat, can either of them be powerful enough to entirely supplant the pancreatic secretion. Umber's researches seem to show that fat-splitting enzymes can be found in the tissues of every organ which has to do with digestion and that the power of digesting fat is more universal than we have thought. This would seem to explain why fat-splitting remains normal even when there is severe disease of the pancreas, provided that the other digestive agents remain uninfluenced. Of course, when digestion as a whole is lowered, then the function of one diseased organ cannot be assumed by the other organs and fat-splitting is imperfect. His observations may explain why we find poor splitting of neutral fat in the stools in some cases of pancreatic disease, and in other cases with exactly the same lesion of the pancreas, the fat-splitting is normal. In his investigations, Umber made an aseptic extract of the pancreas, liver, spleen, and intestinal mucous membrane after these organs had been thoroughly washed to remove the blood, bile, etc., that they might contain. He then tested the fat-splitting power of each of them and of combinations of them upon an emulsion of oil, which corresponded in alkalinity to the intestinal contents. All of the extracts possessed more or less power of splitting fat. Moreover, the extract of organs from animals that were fasting was more powerful

¹ Münch. med. Woch., 1906, No. 31.

than the extract of the same organs taken from animals during the period of fat digestion, indicating that the extract was given off during fat digestion. Various combinations of the different extracts gave very interesting variations in the power of fat-splitting enzymes. Thus it was found that a combination of liver and pancreas extracts from a fasting animal was more powerful than the sum of the two separate extracts; that is, they activated each other. In a digesting animal the combination was not more powerful than the sum of both. So an intestinal extract of a fasting animal somewhat inhibited the action of the pancreatic extract; while the same extract of a digesting animal intensified the action of the pancreatic extract. The splenic extract of a digesting animal, which is in itself a powerful fat-splitting agent, intensified pancreatic extract, and so on. The significance of the relations of these extracts to each other is very interesting, but as yet we cannot interpret their real meaning. The important and practical point in all these investigations is that the power of fat-splitting is one possessed by many organs, so that we cannot rest a diagnosis of disease of the pancreas or of any other organ upon poor fat digestion alone.

Cammidge¹ finds high average percentages of neutral fat in pancreatic disease. His list of pancreatic cases is larger than that of Brugsch, but his results are not absolutely convincing for two reasons:

First, he bases his results upon the proportion of neutral fats and soaps to the dried weight of the stool and not to the amount of the ingested fat, and so makes no allowance for variation in diet.

Brugsch shows by a series of observations upon fifteen cases of all kinds of diseases, including ten of pancreatic disease, that this method is erroneous and often leads to great error.

Secondly, he gives no control series of cases that are certainly not pancreatic.

We may conclude that while serious lesions of the pancreas may cause diminished splitting and a high per cent. of neutral fat in the stool, still neutral fat is not the important sign of pancreatic disease that it has been generally considered, because—

1. Serious pancreatic lesion may exist without an excess of neutral fat in the feces.

2. Other conditions may interfere with splitting besides pancreatic disease.

The diminished proportion of soap as compared with fatty acids in some of Brugsch's cases of pancreatic disease is interesting and should be investigated further. It may prove to be a more valuable method of detecting disturbance of pancreatic secretion than the amount of neutral fats.

¹ Brit. Med. Jour., October 28, 1905.

Albumin Absorption in Pancreatic Disease. The occurrence of relatively large amounts of undigested muscle fiber in the stool has long been recognized as a sign of serious pancreatic lesion. Definite metabolic investigation upon the nitrogen loss in the feces were first made by Abelman in a series of experiments upon animals, as a result of which he placed the nitrogen loss at 46 per cent. in total extirpation of the pancreas. Brugsch has confirmed this and has also made a series of clinical experiments upon cases of pancreatitis and non-pancreatic diseases. He concludes that the albumin loss in pancreatic disease in man is an unimportant symptom as compared with the fat loss. The average loss in the experience of himself and others is 20 to 25 per cent. of the ingested N.

As in the fat loss the albumin loss in jaundice has an important bearing upon the albumin loss in pancreatic disease, since jaundice is so often associated with disease of the pancreas.

NITROGEN LOSS IN PANCREATIC DISEASE WITH AND WITHOUT JAUNDICE. In pancreatic disease without jaundice the N. loss equals 21.1 per cent. In pancreatic disease with jaundice the N. loss equals 33.7 per cent. In jaundice without pancreatic disease the N. loss equals 10.8 per cent. That is, a N. loss of 11 per cent. in a case of jaundice is against pancreatic disease; but a N. loss of 33 per cent. or over is in favor of the involvement of the pancreas. It is very important to remember in this connection that various intestinal conditions reduce nitrogen loss and this may lead to error. Therefore, unless disease of the intestine can be definitely excluded, the N. loss is of little or no diagnostic value in detecting disease of the pancreas. Examples of intestinal conditions that influence N. absorption are disturbance of intestinal secretion as in my case of azorrhea from chronic appendicitis,¹ diarrhea, intestinal dyspepsia in children, degeneration of the intestinal wall (amyloid or tabes mesenterica), and (less important) fevers, gout, and passive congestion. Of course, an increase in fat loss and N. loss in the same patient would be much more significant than an increase in either alone and both conditions should be studied together.

DISTURBANCES OF INTESTINAL ABSORPTION IN DIABETIC ACIDOSIS. In advanced diabetes with acidosis there is often, indeed, usually moderate interference with fat absorption as well as fat-splitting and soap-formation. This apparently is a result of the diabetic process and is no sign that the secretory power of the pancreas is necessarily deemed diminished. The same is true of N. absorption in diabetes. Of course, very great disturbance of either fat or N. absorption would be in favor of a pancreatic lesion. In pancreatic disease there is no disturbance of starch digestion.

¹ Trans. Assoc. Amer. Phys., 1906

A CLINICAL FAT TEST FOR FECES. A. F. Hecht¹ describes a method for determining the amount of fat in the feces. About 10 c.c. of feces are placed in a wide-mouthed flask of 300 c.c. capacity. A piece of caustic potash, about the size of a split pea, is added with just enough water to dissolve it. The whole is heated on a water-bath, upon which the mass of feces becomes translucent. After ten minutes, 100 c.c. of 96 per cent. alcohol are added, and the mixture is heated for twenty minutes more. It is then rendered acid with concentrated hydrochloric acid, and filtered into a porcelain dish. The alcohol is completely evaporated over a water-bath. The residue is taken up with the smallest possible quantity of ether and the solution is filtered into a special measuring apparatus devised by the author. The ether is evaporated. Hot water (over 70° C.) is added, which melts the fats, which are brought into a graduated tube by inverting the apparatus. One division of the scale corresponds to 0.04 gram fat. By simple rule of three the total quantity of fats in the feces can be determined from the amount thus found in 10 c.c. The percentage of fat digestion can also be determined from comparison with the quantity of fat ingested.

The Nucleus Test in Pancreatic Disease. In a paper read before the Congress for Internal Medicine in 1904, Adolph Schmidt, of Dresden, suggested a new method of diagnosis in pancreatic disease, namely, the so-called nucleus test. Schmidt first demonstrated in artificial digestion experiments outside the body that the cell nuclei are digested by the secretion of the pancreas alone and are not affected by the other digestion ferments. He then devised the method of passing small pieces of meat through the gastrointestinal tract and examining them for nuclei after their recovery in the stool in order to determine the activity of the pancreas. One of Schmidt's pupils, Wallenfang, of Bonn, showed experimentally that when the pancreas of dogs is extirpated the nuclei of the meat fiber came through undigested. Wallenfang's experiments seemed to show that the lesion of the pancreas must be complete to produce this effect. In three dogs in which the pancreas was entirely removed the nuclei were never digested. In healthy control dogs they were always totally digested. In one dog in which a small piece of pancreatic tissue was unavoidably left in place the nuclei were all digested.

A series of clinical observations by Schmidt appeared to confirm these experiments. He reported 100 cases of healthy persons and patients with gastrointestinal disease not pancreatic in which the nuclei were always digested. His list included cases of cancer of the liver, closure of the bile ducts by stone in catarrhal swelling, achylia with diarrhea, and tuberculous and catarrhal enteritis and colitis.

¹ Münch. med. Woch., 1906, No. 7, p. 309.

Schmidt examined six cases of pancreatic disease, four with and two without autopsy. Two of the cases with autopsy were instances of incomplete lesion of the pancreas and in the other two the pancreas was entirely destroyed or its duct absolutely closed, so that its secretion was entirely cut off. In the two cases of incomplete lesion the nuclei were completely digested. In the cases of complete lesion the nuclei were not digested.

Hemmeter has also demonstrated the persistence of nuclei in meat after its passage through the gastrointestinal tract in a case of pancreatic cyst and in one of stenosis of the duct after cholelithiasis. Both patients recovered after operation and in a few weeks no nuclei were found indicating resumption of the pancreatic function. These observations of Hemmeter, showing how directly the digestion of nuclei are dependent upon the pancreatic secretion as far as they go, are really more convincing than those of Schmidt, because they show that the nuclei were digested as soon as the obstruction to the pancreatic duct was removed.

Clinical experience with the nucleus test in two cases of pancreatic disease and in twelve other cases, partly normal individuals and partly cases in which there was no suspicion of pancreatic disease, do not entirely confirm Schmidt's contention that the method is a reliable indication of pancreatic disease. I say this because the persistence of the nuclei have occurred in one case in which we had every reason to believe that the pancreatic duct was not entirely occluded, although operation showed some disease of the pancreas. On the other hand, the nuclei regularly disappeared in a case of carcinoma of the pancreas, in which several operations showed very extensive pancreatic disease and in which the chances of total occlusion of the pancreatic duct were apparently much greater than in the first case in which the nuclei persisted. Moreover, the nuclei persisted in a case of achylia without pancreatic symptoms with much regularity. My experimental work with dogs, although careful and quite elaborate, did not give results at all similar to those of Schmidt and Wallenfang. Much work must yet be done before the method can take its place as a reliable laboratory test for pancreatic disease.

The technique of the test is as follows: The meat must not be too long in passing. Schmidt has shown by experiments outside the body that after twenty-four hours the nuclei may be digested by the action of the intestinal bacteria. I can easily believe this, although I have no direct evidence upon the matter, except the nuclei are destroyed around the edge of the meat balls which were passed through the case of pancreatic disease, although the rest of the nuclei were not digested. I usually give the balls with the noon meal and then give laxatives if necessary to insure their recovery next morning, thus allowing about eighteen

hours for their passage. When the meat is carried through too quickly the nuclei will not be digested, presumably because not enough time has been given for the proper action of the digested juices. I have seen this repeatedly in my normal cases in patients with diarrhea. I agree with Schmidt that twelve to fourteen hours should be the minimum period and I feel more certain if eighteen hours are allowed.

The meat balls must not be larger than one-half centimeter in diameter or about the size of a pea. They are cut from the round of beef, hardened in alcohol for a few days, then tied up in a little bag of Brussels net and kept in alcohol until used. The mesh of the net should be fairly large so that the balls can be easily discovered in the stool. A fine silk net-like veiling is undesirable, as it becomes almost invisible when it is wet, and this makes the balls very hard to find. The stools should be examined promptly, best by mixing them with water and passing them through a sieve.

No test should be considered positive unless practically all the nuclei remain intact in several examinations. In my experience the nuclei of the outer sheath of the meat ball are always destroyed, probably by bacterial action in all cases. In positive tests all the nuclei, except this outer layer, should remain intact. In normal cases there are almost always a few nuclei left at the centre of the ball, and often here and there throughout the microscopic sections there are patches of nuclei remaining. Therefore, I think that Schmidt is right when he makes the statement that the test must never be considered positive unless all the nuclei remain intact. Like so many methods in gastrointestinal diagnosis, attempts to draw too fine distinctions will lead to error. We must be content to deal in round numbers and to consider no test positive unless it is decidedly so.

Schmidt says that the examination of nuclei can be made at once by testing the meat fiber in acetic acid. I am certain that not much reliance can be placed upon this method, for the reasons already given, namely, because often in normal cases some nuclei remain intact. Consequently, if we found nuclei in the examination of the teased specimen we could not be certain that the test was positive unless the whole ball was teased and examined. It is much better to imbed, cut, and strain the ball. This can readily be done by one of the modern methods of rapid imbedding, because the sections need not be very carefully prepared and the examination should not take longer than a day or so.

THE PERITONEUM.

The Absorptive Power of the Peritoneum. It is well known that fluids injected into the peritoneal cavity of man or lower animals are very quickly

absorbed. Many surgeons avail themselves of this power of absorption by filling the peritoneal cavity with salt solution after an abdominal section in order to fill the bloodvessels, prevent shock, and increase the flow of urine. (Clark and Norris.¹)

This method of infusing salt solution is much quicker than hypodermoclysis, since practically the fluid is thrown directly into the lymphatic system. Moreover, it has been shown that the peritoneum is capable of absorbing not only fluids, different substances in solution, and gases, but also colloidal substances and even small solid bodies. The reason why these substances leave the peritoneal cavity so easily is explained by several anatomical facts. First, the surface of the peritoneum available for absorption is extremely large. Indeed, it approaches very closely to that of the entire surface of the body. Secondly, the peritoneum of the under surface of the diaphragm presents a great number of openings which are large enough to receive bodies twice the size of red blood corpuscles. These stomata open directly into the lymphatic spaces of the diaphragm and carry the absorbed fluids into the thoracic duct, while the corpuscular elements and solid bodies lodge in the intrathoracic lymph nodes.² This constitutes a very direct mode of entrance for fluids into the general circulation from the peritoneum. The third reason for the ready absorption from the peritoneal cavity is found in the pump-like action of the diaphragm and the peristaltic motion of the intestines, both of which favor absorption. It has been found that lowering of the peristaltic activity lowers the power of the peritoneal absorption, but increased peristalsis does not produce increased absorption.³ So also any factor that will reduce the pump-like action of the diaphragm will lower absorption.

In passive congestion also the absorption is reduced, as is seen in portal obstruction and its resulting ascites. Cold, drying the peritoneal surface, and trauma from foreign bodies will likewise reduce the peritoneal absorption.

Schmidt's Method of Abdominal Infusion. An attempt has been made by A. Schmidt and Meyer⁴ to utilize for therapeutic purposes the extraordinary power for absorption possessed by the peritoneum. To this end they have carried out a series of experiments upon man and animals to confirm and correlate various observations made in the past few years which have shown that it was possible to inject various solutions of foodstuffs, drugs, and gases into the peritoneal cavity without serious risk. They did this with the hope that it would be possible to show the

¹ Jour. Amer. Med. Assoc., August 10, 1901.

² Muscatello, Virchow's Arch., 1895, cxlii, p. 327.

³ Schnitzler and Ewald, Deut. Ztschr. f. Chir., 1895, xli, p. 341.

⁴ Ztschr. klin. Med., 1905.

practicability of administering salt solution and drugs and furnishing nourishment and oxygen to the organism through the peritoneum.

In order to make the injection of fluids into the peritoneal cavity easy and harmless, Schmidt has devised a trocar that eliminates all danger of injuring the intestine in tapping the abdominal cavity. This consists of two parts: One is an instrument that resembles a hollow thumb tack, or short wide needle with a broad base, which is thrust through the skin of the abdomen into the soft tissue of the abdominal wall. The other part of the apparatus is a blunt narrow trocar (2 mm. in diameter) closed at the lower end but with numerous fenestra near this end.

The technique of the insertion of the instrument is as follows: The short thumb needle is inserted as far as it will go through the skin of the median line or in the flanks under local anesthesia. Only in very thin atrophic abdominal walls is there any danger of its passing entirely through and entering the peritoneum. When there is reason to fear this, the needle need not be used and instead a small cut made with a scalpel, or the needle can be inserted obliquely. Then the blunt trocar is connected with the reservoir of fluid and filled, thus expelling all air. It is then thrust with a little force through the remaining tissues into the peritoneal cavity. Then the needle can be withdrawn and the skin drawn tightly about the trocar. The wound that is left after the removal of the needle is very small and needs only a dressing of adhesive plaster.

The insertion of the trocar is generally a very simple process. Only once did Schmidt and his associate find that the peritoneum, which was the seat of a chronic inflammation, was too thick to allow the passage of the blunt instrument. In such cases another attempt should be made at a different point in the abdominal wall. The insult to the parietal peritoneum is very little more from the blunt instrument than when a sharp instrument is used, as Schmidt has shown by autopsies upon moribund men and animals within a short time after the insertion of the instrument. There is practically no danger of injuring the gut in this method. Theoretically, it is conceivable that the bowel might be firmly adherent to the anterior abdominal wall and the blunt trocar might pass through the abdominal wall and through the adhesions into the gut itself. As a matter of fact this has never occurred, probably because it would take considerably more force than is usually exerted to push the blunt instrument into the gut under these circumstances.

The whole procedure should be carried out under the most rigid aseptic precautions, for such injections are attended with considerable danger of infection, since they practically go directly into the lymphatic system. Even when all possible precautions were observed, sometimes symptoms of peritoneal irritation occurred which autopsies upon animals showed were caused by a slight sterile peritonitis. The symptoms were slight

and transient, consisting of pain coming on soon after the injection. This was easily relieved by an injection of morphine. Only once was the peritoneum really infected. This accident followed the injection of olive oil that probably had not been properly sterilized. It occurred in a patient moribund from cancer of the esophagus to whom a previous injection of olive oil had been given without signs of irritation. As a rule, however, with proper precaution, Schmidt's method is a reliable and safe way of injecting fluids into the peritoneal cavity. Although Schmidt does not mention it, his apparatus should prove a safe and easy means of removing fluid from the peritoneal cavity as well as injecting it, and deserves a trial in aspiration of the abdomen and pleura.

Infusion of Salt Solution. Schmidt's experiments and observations upon human beings have shown that infusion into the peritoneum of isotonic salt solution is no more painful than subcutaneous infusion. The advantage of peritoneal infusion over hypodermoclysis, of course, lies in the large amount given by the former method, and the rapidity with which it is absorbed. As much as 2 liters ($3\frac{1}{2}$ pints) and more can be injected without difficulty. Schmidt confirmed Wegner's¹ statement that fluid materials injected into the peritoneum enter the circulation about as quickly as when they are injected directly into a vein.

Infusion of Foodstuffs. It would of course be very desirable to find some method by which food could be given by way of the peritoneum in the same way as salt solution. Rectal feeding has been repeatedly shown to be almost useless,² and subcutaneous injection of foodstuffs has not been satisfactory enough to promise very good results. The quickness and certainty of absorption by the peritoneum are manifest advantages, but a probably greater one is the fact that by this means the food enters the portal system as food should normally and which it does not do in subcutaneous feeding. Consequently the foodstuffs can profit by the synthetic processes that probably take place in the intestinal wall, namely, the reversion of albumoses into albumins, fat synthesis, and so on. Of course, the great disadvantage of peritoneal feeding lies in the danger of irritation and infection. Schmidt first tried injection of sugar solution. He found that it was possible to give moderate amounts in weak solution by the peritoneum. Strong solutions gave much pain and could not be employed. Five per cent. solution of grape sugar with enough salt to make the preparation isotonic did not cause much pain or reaction, though they were distinctly more irritating than isotonic salt solution. Of course, the nutritive value of the sugar solution is inconsiderable.

¹ Arch. f. klin. Chir., 1877, xx, p. 51.

² PROGRESSIVE MEDICINE, December, 1904 and 1905.

The Injection of Albumin Solutions. The success of any attempt to use albumin as a food by means of peritoneal injection largely depends upon obtaining a suitable preparation of albumin. The requirements are that it be soluble and non-irritating, and in such a form that it can be sterilized by boiling. Credé¹ has shown that somatose and protogen, two partially digested foods that can be heated and are perfectly soluble, are quite irritating to the peritoneum and so unsuitable. Schmidt used in his experiments another preparation called kalodal, which is manufactured by Hayden, and which proved comparatively non-irritating. This contained 95 per cent. easily soluble albuminous material. It could be injected in the strength of 5 per cent. in isotonic salt solution without reaction. An amount equal to 20 grains in the twenty-four hours caused albumin in the urine, indicating prompt absorption. Experiments upon animals showed that albuminoses could not be given in amounts sufficient to make a decided impression upon nutrition without bad results. Observations upon three moribund patients showed that it could be used in man with comparative safety, though the poor condition and quick death of the patients from the disease from which they were suffering prevented any conclusions as to the value of the method.

Infusion of Oil. It is in the use of oil that subcutaneous feeding has been most successful. The high caloric value of oil and its non-irritating physical characteristics makes it the most desirable substances for such use. However, it has been shown by Winternitz² that the absorption of oil injected under the skin is very slow, which of course interferes with its value as a foodstuff, since the organism probably cannot absorb, and utilize from the subcutaneous tissues more than 2 to 3 grains (18 to 27 calories) of fat daily, which is an unimportant amount. Perhaps the prospects of affecting nutrition by the peritoneal injection of oil is greater than with any other foodstuff. In a general way the experiments of Schmidt have shown that in the intraperitoneal injection of oil we may have a very valuable addition to our means of influencing nutrition. Schmidt's observations upon human beings show that oil is considerably less irritating than albumin or sugar solutions. Moreover, by autopsies held some time after injection Schmidt showed that even in the moribund cases to whom he gave the injection, the absorption of the oil from the peritoneal cavity is considerable (100 grams in three days). This is much greater than in subcutaneous administration and might well be greater in individuals whose vital processes were more active.

The Value of Intra-abdominal Feeding. Schmidt summarizes his results as follows: The intraperitoneal infusion of oil is safe if done under

¹ Münch. med. Woch., 1904, No. 9, p. 381.

² Ztschr. f. klin. Med., 1903, 1, p. 80.

proper aseptic precautions. Its food value when given in this way is probably considerable, and certainly surpasses its food value when given subcutaneously.

The value of albumin and sugar when given intraperitoneally is, to say the least, doubtful, for it is impossible to give them in sufficient quantities to affect nutrition. The reason why this is so is that solutions sufficiently concentrated to furnish any considerable amount of the food substance are irritating and give pain. Further observations must settle the question whether it is possible to give enough of the weaker and isotonic solutions of sugar and albumin to have any effect upon nutrition.

Peritoneal Infusion of Gases. By means of a very ingenious apparatus Schmidt determined that it was possible to affect the aeration of the blood to a considerable degree by the injection of oxygen gas into the peritoneal cavity. The animal was forced to breathe a certain amount of air over and over again. Another part of the apparatus absorbed the CO_2 from the expired air by means of a NaOH solution. When the oxygen in the allowance of air was used up and the animal approached asphyxiation life could be prolonged by the injection of oxygen into the peritoneal cavity. An interesting part of the experiment was that while oxygen was being furnished by way of the peritoneum the respirations kept regular and full.

Observations upon men showed that the injection of oxygen was harmless if care was taken not to inject too much at one time. When the amount was excessive in animals death ensued and gas was found in the right auricle. Oxygen given intraperitoneally appeared to help cyanosis in pneumonia. A very important part of Schmidt's observation was the beneficial effect that the oxygen injection had upon tuberculous peritonitis. He has treated in all five cases, all of whom were much benefited, and at least two were cured without operation.

Infusion of Drugs. Various attempts have been made to administer drugs through the peritoneal cavity. The list includes chloral hydrate, alcohol, nitrate of potash, sulphate of soda, iodides, salicylates, adrenalin and so on. In a general way it can be said that if the drugs are not irritating and are given in isotonic solution, this method of administration is fairly harmless and the drugs are very quickly absorbed. Schmidt tried but two remedies, namely, infusion of bicarbonate of soda in diabetic coma and the cocainizing of the peritoneum in a case of tabes with gastric crisis. The first was without result and the second was a failure, as it increased the pain.

Peritonitis and Adhesions as a Result of Inflammation in the Epiploic Appendages. Much interest has recently been manifested in inflammatory affections of the sigmoid flexure. It has been recognized that the left iliac fossa has its share of acute peritoneal inflammation as well as the

right, and the clinical picture of acute sigmoiditis is quite similar to that of acute appendicitis. *Sigmoiditis* arises from a variety of causes.¹ Important among them is inflammation of the epiploic appendages, which may give rise to local abscesses with tumor formation, much resembling that seen in appendicitis.

Riedel² calls attention to another way in which the appendages may produce trouble. He says that they may become twisted until their distal ends are severed. These ends then act as foreign bodies in the abdominal cavity. Ordinarily they produce no symptoms, but sometimes they may cause serious disturbances, even peritonitis. The proximal ends of these detached appendages are liable to inflammation with adhesions, forming bands that may lead to intestinal obstruction.

The author reports four cases in which the detached epiploic appendages had given rise to symptoms severe enough to demand operation. In two of these cases the clinical picture resembled gallstone colic with cholecystitis; in a third case a diagnosis of appendicitis was made; while the fourth case, a woman, gave the appearance of peritonitis from infection through the genitalia. In this last case the *bacillus coli communis* was isolated from the detached appendage; how the organism got there, however, is a mystery. Two additional cases are reported in which an intestinal strangulation was caused by the formation of adhesive bands from the proximal ends of detached epiploic appendages. After a certain amount of torsion has caused a separation of a part of the appendage, inflammatory changes occur at the seat of torsion, leading to the formation of these strangulating adhesions. Two such cases are reported, in which these twisted appendages found their way into hernial sacs, giving rise in each case to an irreducible and painful tumor that required operative treatment for its relief. In one case the appendage was merely twisted, while in the other case the torsion had already given rise to separation, and the formation of a foreign body.

¹ PROGRESSIVE MEDICINE, December, 1905.

² Münch. med. Woch., 1905, No. 48, p. 2308.

GENITOURINARY DISEASES

By WILLIAM T. BELFIELD, M.D.

THE URINARY ORGANS.

Tuberculosis. Halle and Motz¹ present the views of the Guyon school on tuberculosis of the urinary tract. Stress is laid upon the observation that the primary focus is commonly in the kidney; that the ureter catheter often recognizes the early dilatation of and stagnation in the ureter, while the cystoscope shows ulcers at and near the affected ureter orifice.

So long as the process is free from pus infection, it remains quiet and practically afebrile, the kidney being transformed into caseous masses and the ureter obliterated. These changes occur in many cases without notable clinical signs; the entire kidney being functionally destroyed and the opposite organ hypertrophied without symptoms causing a suspicion of extensive disease of the organ. If, thereafter, the second kidney develops symptoms which seem to require surgical interference—a frequent occurrence—the surgeon who neglects the preliminary precaution of determining the functional activity of the unsuspected kidney by means of the ureter catheter is surprised after a satisfactory operation to see the patient die in a few days of uremia, and to discover post-mortem the unsuspected ruins of the non-operated kidney. This was a common experience before the ureter catheter came into general use, and is still among those surgeons who fail to use it.

Direct medication of the ureteral infection through the catheter is usually unavailing, because the renal lesion, inaccessible to such medication, preponderates.

The only promising treatment is surgical—the total removal of the kidney and ureter so far as the latter may be accessible. Some surgeons favor allowing the ureter to remain if it be found free from pus infection, since the tuberculous infection of the ureter usually becomes dormant after the removal of the kidney.

While this statement represents fairly the position of surgeons the world over, yet individual cases are occasionally reported in which the tuberculous lesion seems—perhaps because confined largely to the ureter—to be symptomatically cured by medication of this canal through the

¹ *Annales des Maladies des Organes Genitourinaires*, Nos. 3 and 4, 1906.

ureter catheter. Thus Kreissl¹ relates the case of a girl, aged eighteen years, who developed frequent and painful urination with pus in the urine. The cystoscope showed typical tubercles in the trigonum, an ulcer near the left ureter orifice which was elevated and congested. The catheter passed three inches into the left ureter, gave exit to a creamy, purulent liquid; when the instrument reached a point about six inches above the orifice clear urine escaped. Some tubercle bacilli were found in the creamy liquid from the lower but none in the clear urine from the upper segment of the ureter.

Primary tuberculosis of the bladder with ascending infection of the ureter was suspected and treatment instituted on this hypothesis. This consisted of 5 per cent. iodoform guaiacol suspensions, alternating with bichloride solutions in the bladder and lower segment of the ureter. The ulcers healed in about a month, and the tubercles disappeared later; the urine became clear and free from bacilli and the subjective symptoms correspondingly improved. This apparent recovery has continued for several months.

While exception might be taken to Kreissl's assumption of a primary infection in the bladder, yet the possibility of an ascending infection from the lower segment of the ureter cannot be denied. This has been shown to occur experimentally by Baumgarten;² while ordinarily he has seen the tuberculous infection travel with the stream of urine or semen in ureter and vas deferens respectively, yet he found that when he ligated either of these canals with silk infected with tubercle bacilli the tuberculous process gradually extended backward, *i. e.*, against the stream. It is easily conceivable that in cases similar to Kreissl's the constricted portion of the ureter passing through the bladder wall—well known to be especially susceptible to this infection—may present the earliest lesion; and that the reactive swelling of the tissues and consequent retention above this segment may, like Baumgarten's infected ligature, have resulted in an ascent of the infection.

At any rate, leaving aside pathological speculations, Kreissl's observation has distinct clinical importance; it indicates that in this case at least the infection in the ureter was not an extension from the kidney, and the success of his local treatment offers encouragement for repetition.

CARBOLIC ACID TREATMENT OF VESICAL TUBERCULOSIS. Rovsing,³ whose favorable results by this method were reported to the German Surgical Society last year,⁴ gives his further experience with the disease, now comprising fifty-six cases. He states that primary tuberculosis of the

¹ Journal of Urology, July, 1906.

² Berl. klin. Woch., 1905, No. 44.

³ Jour. Amer. Med. Assoc., 1906, p. 903 (abstract).

⁴ PROGRESSIVE MEDICINE, December, 1905, p. 114.]

genital organs seldom invades the bladder, which is, moreover, rarely the seat of primary tuberculous disease; this infection of the bladder is usually an extension from an infected kidney, and this renal disease can be positively affirmed only when the urine is obtained through the ureter catheter. He affirms that a tuberculous lesion of the bladder may invade the second ureter spreading upward toward the sound kidney; the urine from this ureter will then contain pus and tubercle bacilli, though the kidney beyond is still free from the infection. In such cases he advises a double exploratory lumbar incision which may show one kidney to be sound, whereupon its fellow may be safely removed. After such removal the tuberculous lesions of bladder and ureters, if not too far advanced, may heal spontaneously.

In the cases of extensive and intractable tuberculous lesions of the bladder he strongly recommends local treatment with carbolic acid, with which he asserts he has completely cured thirteen patients. His method is this: The bladder is cleansed of pus by means of sterile water; then 50 c.c. of a 6 per cent. aqueous solution of carbolic acid, warmed to about 35° C. (95 F.), is injected; this is retained three or four minutes and then allowed to escape. This procedure is repeated three or four times until the escaping liquid, at first milky, comes away rather clear. The bladder is not rinsed after the escape of the final injection. A rectal suppository containing 2 cg. ($\frac{1}{3}$ gr.) of morphine is introduced immediately after the injection to mitigate the pain, which is otherwise severe for two or three hours after the treatment.

These injections are at first made every second day; but when the urine of the intervening day becomes nearly clear, the intervals are lengthened to three and four days. The vesical interior is inspected through the cystoscope once a week at first, then at longer intervals. The tubercles disappear, the ulcers heal, leaving a smooth white surface. Rovsing thinks that the carbolic acid penetrates the interstices made into and between the cells, the direct toxic action of the acid being enhanced by the phagocytosis induced by its presence.

He has never seen any serious effects produced by this treatment; occasionally the urine is rendered transiently smoky. The only drawback is the pain caused by the acid, and this can be deadened by morphine. Treatment lasts from one to six months. A radical cure is possible only when the vesical lesion is primary (and this practically never occurs) or when the primary focus in the kidney has been removed.

In the cases that I have treated by Rovsing's¹ method since reading his report to the German Surgical Society in 1905, I have been impressed with the notable fall in temperature which almost invariably follows

each treatment. The results have been so good that I have made similar injections of 1 to 2 c.c. each of a 2 per cent. solution into the tuberculous seminal vesicle through the vas deferens, after the method reviewed in this publication a year ago,¹ but without benefit.

The Bier method of artificial hyperemia was used in the treatment of three cases of tuberculosis of the testis (epididymis) by Michaux,² who failed to observe any beneficial effect whatever therefrom.

Actinomycosis, apparently limited to the urinary organs, and identified only postmortem, is reported by Stanton.³ While it is conceivable that the fungus, entering the circulation through the lung or intestine, might lodge and multiply in the kidney only, yet urinary actinomycosis has usually been demonstrated to be secondary to older foci of infection in the pulmonary or digestive organs, as in urinary tuberculosis.

Amebiasis. McDill⁴ reports from Manila a case of infection of the urinary bladder with amebæ; an attendant who had given a colonic flushing in a case of intestinal infection irrigated the bladder of a second patient without previously cleansing his hands. The observation is valuable as showing the susceptibility of the vesical mucous membrane to this parasite.

Cancer of the Bladder from Bilharzia. Goebel⁵ states that at least 50 per cent. of the many tumors of the bladder observed in Egypt in subjects of bilharzia disease are cancerous. He considers the irritation caused by the parasite an exciting cause of the malignant disease, just as the soot is the irritant cause of chimney-sweep's cancer of the scrotum, and paraffin the cause of epithelioma of the hands.

The same author remarks⁶ that while urinary lithiasis is comparatively rare in upper Egypt, it is exceedingly common in lower Egypt; the difference corresponds to the absence of the bilharzia parasite in upper Egypt, and its frequent occurrence on the lower portion of that land. The desquamation of the epithelium in the bilharzia infected bladder is very profuse and this doubtless contributes to the precipitation of urinary salts.

Tumors of the Urinary Organs. Keydel⁷ furnishes an elaborate review of the treatment, especially surgical, of vesical tumors, including twenty-nine cases observed by Oberländer and himself.

The surgical treatment of vesical tumors was begun by Billroth, who in 1874 successfully removed a large tumor—found to be a myoma—from

¹ PROGRESSIVE MEDICINE, December, 1905, p. 137.

² Société de Chir., July 4, 1906.

³ Albany Med. Annals, November, 1905.

⁴ Medical News, December 16, 1905.

⁵ Zeit. f. Krebs., Band iii, Nos. 3 and 4.

⁶ Deutsch. Zeit. f. Chir., Band lxxxi, No. 2.

⁷ Centrbl. f. Krankh. der Harn und Sexual Organe, 1906, No. 6.

the bladder of a boy through a suprapubic incision. Sir Henry Thompson a few years later began the systematic digital exploration of the bladder for diagnostic purposes, through a median perineal urethrotomy. In three years he had identified nineteen cases of vesical tumor, extirpating such as could be removed through this incision. This work of Thompson's was the real beginning of the diagnosis and treatment of vesical tumors; the present writer discovered and removed two bladder tumors by the Thompson method in 1885. The invention of the cystoscope, however, at once placed the diagnosis of those tumors upon a basis of precision and paved the way for more accurate methods of treatment.

For clinical purposes Keydel considers that bladder tumors may properly be divided into two classes—papilloma and cancer; admitting that the distinction is sometimes impossible until the tissue has been microscopically examined. It might be added that even then the subsequent clinical history does not always follow the course predicted by the microscopist.

THE PAPILLOMATA were in earlier years removed through a suprapubic incision without excision of the base from which they sprang. 48 such operations were collected by Albarran in 1892; of these about 75 per cent. remained free from recurrence so far as could be ascertained, though only 10 of these were traced more than one year, 3 of them for four years. In 9 cases (19 per cent.) recurrence of the growth was known, in 1 case four years after operation. In 6 per cent. death followed the operation.

In 1895 Clado collected 62 such operations, with virtually identical results.

In the same year Albarran reported 19 personal operations without an operative death; only 6 of these were traced, all of them escaping recurrence and 4 remaining well from three to fourteen years after operation; 1 patient had to be operated on three times in twelve years, the subsequent growths being apparently independent of the original as well as of each other.

Rafin (1905) collected 109 cases from the literature with 15 operative deaths. Of the 26 cases that could be followed, 15 remained free from recurrence (5 of them were followed more than three years) and 9 had recurrence.

Rafin personally observed 156 operations with 6 deaths. In 45 cases the subsequent history was known. 21 were known to be free from recurrence at periods ranging from three to fourteen years after operation, while in 24 recurrence was observed, including 2 cases when such recurrence appeared in the seventh year, 1 in the eighth, ninth, and tenth years respectively.

Similar statistics are furnished by Motz, Burkhardt and Lobstein.

Nitze developed the method of removing papillomata through the cystoscope; he reported 101 such operations with 1 death. Of these 71 were followed for long periods without discovery of recurrence, while in 18 such recurrence was observed.

This intravesical work of Nitze's, by the way, is the most favorable ever reported by any method both as to operative mortality and freedom from recurrence.

CARCINOMA OF THE BLADDER has furnished a sadly different history, especially in the earlier period, when no resection of the bladder was practised. Albarran in 1892 collected 97 operations, with 43 operative deaths and 31 recurrences—all but 8 within a year after operation; only 1 of the 23 remaining cases was known to be free from recurrence at the end of three years.

Clado's statistics in 1895 were but little better.

Rafin in 1905 reported 57 cases of extirpation of vesical cancer, with 8 operative deaths; of the 38 survivors whose subsequent history was ascertained nearly all died within six months of the operation.

Partial resection of the bladder was made in 96 cases with 21 operative deaths; of 52 survivors whose subsequent history was traced, 24 died of recurrence within the first year, and only 5 were free for more than three years.

Total extirpation of the bladder was made in 30 cases, 17 of whom died as a result of the operation; of the 8 survivors who were subsequently traced, all died except 2, and in these microscopic examination of the growth had not been made.

In the light of these experiences it is evident that the surgical treatment of malignant bladder tumors has not as yet furnished results in any degree satisfactory. Bazy declared to the Urological Congress that no material improvement in results has been shown in the past twenty years. Recurrence seems to follow even early operation with appalling regularity; and total extirpation of the bladder has furnished no distinct increase in immunity against recurrence.

Broad based tumors are especially unfavorable and malignant after operation.

That operation seems to add virtually nothing to the duration of life of the survivors is illustrated in Pousson's tables—those not operated upon living on the average sixteen months and two weeks, the operated sixteen months and three weeks after the first examination.

Even the papillomata are seldom permanently cured; thus Burkhardt operated on eleven cases without an operative death, yet all but one died of early recurrence. The recurrent tumors seem to grow more rapidly than the original.

Watson¹ also reviews the operative treatment of tumors of the bladder basing his conclusions on the records of 653 cases that he has found in the literature. Of these 243 were benign and 410 malignant.

The operative mortality following removal of benign tumors was 12 per cent.; of malignant growths, 27 per cent. Rapid recurrence was observed in 20 per cent. of the cases styled benign and in 27 per cent. of those considered malignant.

The deaths from operation and from early recurrence constituted 29 per cent. of the benign, and 46 per cent. of the malignant tumor cases.

Total extirpation of the bladder for cancerous disease was followed by a mortality of 56 per cent., besides recurrence in an undetermined percentage.

Trephin² reviews the subsequent history of 45 patients whom Kümmell has operated for tumor of the bladder during the past twenty years. These were found to be: papilloma in 34 cases, carcinoma in 9, sarcoma and cyst in 1 each.

Of the 34 villous tumors 19 were malignant, in 6 of which the transformation of a benignant into a malignant growth seemed highly probable. In 3 of the 12 cases in which the tumor seemed at the time of removal to be an innocent papilloma, malignant recurrence followed; in 2 others benignant tumors were subsequently removed. In 1 case multiple papillomas recurred four times in twelve years.

Only 6 of the 30 patients with malignant tumors still survive, after intervals of seven to sixteen years; in 1 of these the tumor was a sarcoma, in the others a villous growth.

In all cases an effort was made to extend the incision into sound tissue, and this procedure entailed resection of sometimes a third, twice about half of the bladder.

Kümmell considers excision indicated in all cases of malignant vesical tumors; while permanent freedom from the growth is secured in only a minority of the cases, the patient's condition is in all rendered more endurable.

Leucoplasmia of the bladder is discussed by Posadas³ with the report of a case personally observed. The most prominent symptom is hematuria associated with fever; the diagnosis is made by the cystoscope.

In his case the trouble was completely cured by internal antisyphilitic treatment, which he thinks should be tried in every case before surgical interference is undertaken.

Vesical Varices. Leatta⁴ performed lithotripsy in a man aged fifty-five years; the operation was followed by bleeding so severe that the

¹ Annals of Surgery, December, 1905.

² Deut. med. Woch., 1906, No. 19.

³ Annales des Maladies des Organes Genitourinaires, 1906, p. 58.

⁴ Centrbl. f. Krankh. der Harn und Sexual Organe, 1906, p. 37.

bladder was opened by suprapubic incision to check the hemorrhage. Many varicose veins were found, some of them ruptured. Death from infection of the suprapubic wound followed.

Foreign Bodies in the Bladder and Urethra of the Male are discussed by Englisch,¹ who has personally observed 10 such cases. The foreign bodies observed have been of 27 kinds, including pieces of catheters in 220 cases, a hat-pin in 41 cases, fragments of bone in 59, a knitting needle in 32, bullets in 24 cases. In over 4 per cent. of the bladder cases the foreign body was spontaneously expelled. The 750 patients ranged in age from five to eighty years.

Prophylactic Filling of Bladder at Operations. Frankenstein² states that the postoperative retention of urine was formerly observed at the Kiel clinic in 55 per cent. of the laparotomies; while now it occurs in less than 4 per cent. This improvement is ascribed to the recent custom of distending the bladder with normal salt solution before the suturing of the abdominal wound is completed; from 350 to 400 c.c. is the quantity commonly used.

Trigonum Cystitis was found by Heymann³ in nearly all of twenty women whose bladders were examined postmortem, their ages ranging from seventeen to sixty-four years. He states that the trigonum epithelium is seldom found normal in women over forty years of age; he thinks that the frequency of trigonum cystitis in elderly women is due to the weak mechanism for vesical closure, and consequent infection from without.

Cystotomy in the Female is practised and advised by Garceau,⁴ in cases of intractable infections of the urinary channels—tuberculous or other in which frequency and pain in urination become serious factors. The opening into the vagina may be closed after the cause of the vesical irritability has been relieved. This measure, formerly practised quite frequently, has fallen into deserved disuse by the employment of modern methods of precision, notably the cystoscope and the ureter catheter—whereby the formerly undetected causes of “cystitis” and irritable bladder can now be discovered and in many cases removed. Vaginal cystotomy should be reserved for those cases in which these precise methods have been employed without success.

The Mechanism of Vesical Closure has been studied by Oppenheim and Low.⁵ While it is generally admitted that the chief sphincter of the bladder is the muscular bundle surrounding the membranous urethra,

¹ Deutsch. Zeit. f. Chir., Band lxxix.

² Beiträge zur Geb. und Gynäkologie, Band x, Heft 2.

³ Centrbl. f. Chir., Band vii, Heft 4.

⁴ Journal of Urology, September, 1906.

⁵ Centrbl. f. Krankh. d. Harn u. Sexual Organe, 1906, p. 66.

yet there is a difference of opinion as to the existence of a distinct sphincter at the vesical orifice. These observers studied this question by injecting the bladders of apes with emulsions of bismuth and of collargol and then picturing the organs thus distended by means of the Röntgen ray. Skiagrams thus made accompany the article.

With a moderate distention of the bladder, the skiagram invariably showed a funnel-shaped orifice including the prostatic urethra and terminating at the membranous portion; from which appearances the authors draw the inference that the vesical orifice does not offer much restraint to the exit of urine, and that the perineal sphincter alone is responsible for the closure of the bladder.

Leedham Green¹ furnishes radiograms made by injecting human bladders with bismuth emulsion. In his pictures the funnel-shaped bladder neck is absent; in other words the internal sphincter at the vesical orifice is shown so firmly contracted as to prevent the passage of the injected emulsion into the prostatic urethra—a result directly opposed to that pictured by Oppenheim and Low.

While these divergent results might be explained by differences between simian and human anatomy, or by differences in the intravesical pressure, yet such explanations need not be sought. For every surgeon who has made digital exploration of the bladder through a median urethrotomy, is well aware that there exists a distinct, even powerful, sphincter action at the vesical orifice. To such surgeons it is well known that after complete division of the perineal sphincter the bladder contents are retained by closure of the vesical orifice.

Whatever discrepancies, then, may be furnished by radiograms, it is certain through surgical experience that there exists a firm closing mechanism at the vesical orifice, independent of the muscular bundles surrounding the membranous urethra.

Wolff,² by injecting bismuth emulsion and making a radiogram, demonstrated a *bilocular bladder*; he recommends this method for the detection of vesical herniæ and diverticula.

Person³ has collected from the literature 30 cases of *appendiculo-vesical fistula*, few of which have been recognized prior to operation, in spite of the aid procurable by the cystoscope when used.

Anuria, especially in its surgical aspects, is discussed by Cumston.⁴ He recognizes:

1. *Hysterical anuria*, without demonstrable renal lesions. This seems to be due to spasmodic contraction of the renal arteries, which is over-

¹ Centrbl. f. Krankh. d. Harn. u. Sexual Organe, 1906, No. 5.

² Zeit. f. Chir., 1905, No. 24.

³ Annales des Maladies des Organes Genitourinaires, 1906, p. 797

⁴ Journal of Urology, 1906, p. 397.

come by inhalation of chloroform or injection of morphine, as well as by the restoration of the emotional equilibrium. Anuria from this cause may continue for many days without evidences of uremia, the excreta normally discharged by the kidney being ejected by vomiting and purging.

2. *Toxic anuria*, from lead or cantharides poisoning, seems likewise to arise from undue contraction of the renal arteries as well as from direct interference with the secreting cells.

3. *Reflex anuria*, so-called, has been disputed by surgeons; while there is ample clinical proof that the arrest of function in one kidney—by plugging of the ureter with a calculus, for example, has been followed by complete arrest of function in the opposite organ. Yet in most cases submitted to critical examination this second kidney, exhibiting so-called reflex anuria, has been found to be diseased. Still, experiments upon animals have shown that the function of a healthy kidney can be arrested by nervous influence without any direct interference with the kidney in question. Notable among these experiments in their clinical application are the observations of Gotze. He inserted a glass tube in each ureter of a normal dog, and measured the output for certain periods. Salt solution was then injected into one ureter; this increase in pressure was immediately followed by a decrease of secretion from the opposite kidney. The same phenomenon was witnessed when one ureter was artificially obstructed.

Clinically, analogous cases have been often observed. Israel, for example, has reported cases in which increased tension in a floating kidney caused by acute flexion of its ureter, arrested the function of the opposite and healthy kidney—which was completely restored so soon as the tension in the first organ was reduced. The polyuria often observed from the remaining kidney after nephrectomy, seems to result from the removal of a reflex restraint exercised by the diseased kidney prior to removal.

4. *Traumatic anuria*—the arrest of function in a healthy kidney following injury to its fellow seems also to be a reflex phenomenon brought about through the nervous system. Several such observations have been recorded; though Israel explains such by cardiac weakness rather than nervous influence.

The treatment of anuria following disease, injury, or removal of one kidney should be prompt exposure and examination of the opposite organ, and usually nephrotomy. So many cases of prompt restoration of the renal function after this procedure have been recorded, that it may be considered the standard method of treatment. Even when no calculus or obstruction of the operated kidney has been found the result has usually been gratifying.

Calculus Anuria in a man aged seventy-four years was observed by Monod,¹ who promptly did a nephrotomy and removed the calculi. At the autopsy a few days later the operated kidney was found to be much hypertrophied while the opposite organ was a mere sac without a ureter.

Legueu and Routier, commenting upon this case, say that it illustrates the general rule that in calculous anuria the opposite kidney is functionless or absent.

Bazy agreed in this opinion except that cases occur in which both ureters are simultaneously blocked by calculi; he has had one such case.

Routier stated that ten years ago he opened the right kidney of a patient for calculous anuria, and repeated the procedure three years ago; the patient is still in good health.

Diagnosis of Renal Diseases. Kapsammer² made an exhaustive report on this subject to the International Medical Congress, paying special attention to the newer methods, such as cryoscopy and the excretion of dyes by the kidneys.

He considers the segregation of the urines by means of the ureter catheter as the most valuable advance made in recent years in the diagnosis and surgical treatment of kidney diseases. Among the interesting information furnished in his article is the following: In the last ten years among 20,770 autopsies made in large Austrian hospitals where these newer methods, even the ureter catheter, were not employed, were observed 750 cases of pyelitis, over two-thirds of which had been unsuspected during the lives of the patients; of 400 cases of other diseases of the renal pelvis, including tuberculosis, calculi, and neoplasms, less than one-fourth were detected during life, over three-fourths of the subjects coming to the postmortem table without a suspicion of these lesions having been expressed by the attending physicians. It was further noted that in 118 cases unilateral pyelitis existed, and in 67 patients, unilateral tuberculosis was discovered.

Operations for Nephritis. Ekehorn³ analyzes numerous articles on this subject, adding reports of two personal cases of acute infectious nephritis, and four of renal hematuria in chronic nephritis. He concludes that hemorrhage from the kidney is due not so much to the anatomical changes in the kidney as to the toxic substances in the blood which induce these structural changes. He also lays stress upon the mechanical element in the causation of renal hemorrhage; the increased blood tension consequent upon the altered position of the kidney, its adhesion to its surroundings, etc. He thinks that the arrest of hemorrhage which

¹ *Annales des Maladies des Organes Genitourinaires*, 1906, p. 1177.

² *Ibid.*, p. 1173.

³ *Abstract in Jour. Amer. Med. Assoc.*, 1906, p. 814.

usually follows a simple nephrotomy—as it did in each of his four cases—is to be explained largely by the relief of this tension in the kidney itself.

Acute Unilateral Septic Infarcts of the Kidney is the subject of a valuable paper by Brewer,¹ who states that the object of his communication is to report a series of clinical and experimental observations upon a type of acute hematogenous renal infection which has not received from the profession the attention it deserves.

Practically all authorities upon general and genito-urinary surgery agree that renal suppuration may arise from infection conveyed to the organ by a penetrating wound, by extension from a neighboring septic focus, by an ascending process from the lower urinary passages, or by the blood current.

The presence in the blood of pathogenic micro-organisms capable of producing metastatic accidents in the kidneys may, according to Israel, arise from absorption from the intestine, from acute infectious diseases, from local suppurations, as furuncles, carbuncles, paronychias, etc., and also from infection of the lower urinary passages.

It would naturally be inferred that such blood infections would produce bilateral lesions, but Israel, Simon, Alexander Johnson, and others have emphasized the fact that in a large number of cases of hematogenous infection the renal lesions are unilateral, the cause which determines the lesions in one kidney only being a diminished resistance of that organ as a result of previous disease or injury.

In enumerating some of the predisposing factors, Israel mentions calculus disease, ureteral obstruction producing renal retention, trauma, floating kidney, etc., as frequent determining causes of unilateral lesions.

Singer, in 1883, reported a case of unilateral renal suppuration occurring during an attack of typhoid fever, in a kidney severely injured eighteen years before the attack. Quinke reports a similar case seventeen years after such an injury. Numerous other examples of unilateral renal suppuration, following trauma, are reported by Simon, Tuffier, Rayer, Johnson, Rosenburger, and Levi.

Regarding the infecting agent in these cases, Israel considers the colon bacillus the most frequent, but also reports cases due to the streptococcus and staphylococcus aureus. Alter has reported a case of unilateral renal abscess in which the pneumococcus was demonstrated. Cases due to the typhoid bacillus have been reported by Singer and Comba. Cohn, in 1902, reported four cases of suppurative nephritis, in which the infection was traced to furuncles, in one of which the presence of a calculus was evidently the determining cause. More recently Jordon

¹ Surgery, Gynecology and Obstetrics, May, 1906.

has reported twelve cases of renal and perirenal suppuration, in which small foci of peripheral infection were considered as etiological factors.

In nearly all of the cases to which reference has been made the disease was well advanced, and one or more fairly large collections of pus were found. It is not, however, of these easily recognized terminal conditions of renal infection that Brewer speaks, but rather of the earlier stages of the process, when the clinical picture is often one of an acute general infectious disease, in which the local manifestations are so slight, and so generally overshadowed by the symptoms of general toxemia that they are frequently overlooked, unless a more than ordinarily careful physical examination is made. These cases are often so acute in their onset, and so rapidly progressive in their septic manifestations, that death may ensue before any distinctive renal or urinary symptoms are observed.

During the past ten years Brewer has observed some 12 or 14 such cases, presenting practically identical clinical histories, but the importance of the observations was not appreciated until, after a number of fatal cases, an autopsy revealed the true nature of the disease and directed his attention toward more prompt and radical treatment.

In his earlier cases Brewer made a simple nephrotomy, saving only 1 out of 5. He then began the performance of nephrectomy for this condition saving 6 out of 7. He therefore advises the immediate removal of the infected kidney so soon as the diagnosis is made and the integrity of the opposite kidney established.

Of the 13 cases reported 11 were women, 2 men; in 11 instances the right kidney was affected, in 2 the left. Harris called attention to these data, remarking that the frequent occurrence of displacement of the kidney in women, usually on the right side, might explain the frequency of this affection in women and on the right side. For this displacement means an interference with the renal circulation, with consequent impairment of the nutrition of the kidney which would render this organ more susceptible than its fellow to the invasion of bacteria circulating in the blood.

Brewer states that a distinct history of previous injury to the affected kidney was obtained in two instances; of previous disease in one. It could probably have been obtained in others had its importance been appreciated at the time of their observation. In five cases there was a recent history of some febrile disorder, one of which seemed to have been scarlet fever.

With a view to studying this condition more carefully, and to ascertain why, during a general blood infection, a single kidney should so frequently be the seat of such grave lesions, Brewer made a series of experiments upon animals. These consisted essentially in inflicting an injury upon

one kidney and infecting the blood current with some pyogenic bacterial species.

A review of these experiments will show that none of the control animals which had received a moderate dose of pathogenic bacteria directly into the circulation without other injury developed a surgical lesion of the kidney. Of the 16 animals which, in addition to the inoculation, received an injury to one kidney, 5 showed no lesion, or only hyperemia and parenchymatous degeneration; 2 of these animals died within twenty-four hours of acute septic intoxication. Of the remaining 11, all developed distinct surgical lesions of the kidney. In 8 the lesions were unilateral, and limited to the injured kidney. In 3 the lesions were bilateral. In 1 of the bilateral cases the lesions were practically equal in extent and in severity. In the other 2, the lesions in the uninjured kidney were mild in character and undoubtedly would have recovered under favorable conditions. The renal lesions produced by these experiments were practically identical with those observed in our clinical cases. They showed considerable variation in number, extent of renal destruction, and the degree of resulting toxemia. While these experiments have not been sufficiently numerous nor varied to investigate all of the causes which might direct a given blood infection toward one kidney, still they demonstrate in a very conclusive manner that injury to a single kidney whether produced by trauma, by the presence of a foreign body in the pelvis, or by an acute obstruction of the ureter, certainly acts as a strong predisposing factor in the evolution of a surgical lesion of that organ.

In conclusion, Brewer desires to state that he lays no claim to priority in the recognition of unilateral suppurative disease of the kidney; the object of this communication being simply to direct attention to the earlier stages of the affection, when the diagnosis is often obscure, and the clinical picture is one of a grave general disease rather than a purely local disorder, and to emphasize the fact that in the more virulent forms of the disease the progress is rapid toward a fatal termination unless promptly arrested by radical surgical measures.

Ureteral Lavage is discussed by Ayres.¹ He considers the field for this measure decidedly limited, for without a coincident pyelitis or nephritis, ureteritis is rare, its origin in these unusual cases being found in some local condition such as kinking of the ureter or an impacted calculus. In only one condition is lavage of the ureter indicated so soon as the diagnosis is made, namely, ureter stricture; while the cure of this condition requires the dilatation of the stricture, yet lavage after each passage of the sound accelerates the improvement.

¹ Journal of Urology, September, 1906.

Practically ureteral lavage is useful only when the ureteritis is caused by stricture or is associated with pyelitis; and in these conditions it should be employed only after medication without local treatment of the ureter has failed.

The initial injection through the ureter catheter should not be more than 2 c.c., which is allowed to escape; after about 60 c.c. have been injected in ten or twelve parts, the catheter is withdrawn about 10 cm. and the lavage is repeated. In this way the entire lumen of the ureter can be irrigated. Injection of too much liquid at a time or of strong solutions may provoke severe renal colic. In all cases the bladder and urethra should be washed out after the removal of the ureter catheter.

The patient should lie quiet for about thirty minutes after the first treatment, and should avoid needless exertion.

For catarrhal inflammations silver nitrate in boric acid solution is preferred, the initial strength being one to eight thousand, and gradually increased to one to four thousand. Against pus infections of the ureter and renal pelvis freshly dissolved argyrol, in 15 per cent. solution, is preferred; in some cases a saturated solution of boric acid seems to give the best results.

Lavage is done once in two to five days, according to the urgency of the case; this treatment may be continued for two or three months. Catheters may be allowed to remain in the ureters for several days.

The Kolischer-Schmidt Method of Identifying the Ureter proved of signal service in a case reported by Reichmann.¹ A healthy man, aged thirty years, had for some time suffered from attacks of colic referred to the left side of the abdomen; repeated examinations of the urine showed this secretion to be normal.

Skiagrams made by Reichmann showed small shadows on each side in the vicinity of the course of the ureters. Through the cystoscope a lead wire was introduced into the ureter by Schmidt; a skiagram then made showed that the bodies suspected to be ureter calculi lay at least 2 cm. from the wire. Their nature remained unexplained.

The attacks of colic in this patient suggest spasmodic contractions—"colic"—of the left seminal vesicle. Such spermatic colic can be promptly induced by injection of liquid into the vesicle through the vas deferens;² and in one case in my experience have been caused by a concretion in the vesicle. Possibly the shadows on Reichmann's plate were concretions in the vesicle.

¹ Fortschritte auf der Gebiete der Röntgenstrahlen, Band ix.

² PROGRESSIVE MEDICINE, Vol. IV, 1905, p. 137.

THE GENITAL ORGANS.

Gonorrhea. THE BIER METHOD OF INDUCING VENOUS HYPEREMIA was tried by Hirsch¹ in 25 cases of *gonorrheal arthritis* of the milder grades. A critical summary of the results shows no marked advantage over the methods ordinarily employed.

INTRAVENOUS INJECTION OF COLLARGOL was made by Heman,² in a boy with *gonococcus infection of the endocardium and other serous membranes*, high fever and erythema nodosum. After long observation the right cubital vein was opened to secure blood for bacteriological examination and 3 c.c. of a 2 per cent. collargol solution was injected. An immediate drop of temperature occurred and recovery from all symptoms promptly followed.

Stollkart³ observed two cases of scarlatiniform eruption lasting from four to seven days, but without fever, during gonorrhea.

Becker⁴ observed three cases of gonococcus infection presenting unusual symptoms: the first was found to have a suppurating myositis in the forearm; the pus removed by incision contained gonococci; recovery followed. The second patient presented an acute gonorrheal infection of the prostate and of the pericardium with extensive exudation; it terminated in recovery. The third case was a girl with acute gonorrhea who after a forceps delivery exhibited evidences of infection of the ilio-sacral and symphysis joints.

Prochaska⁵ reports from Eichhorst's clinic the postmortem examination of six cases of gonococcus infection. Besides cases showing infection of the endocardium, meninges, and various joints, there was one worthy of note because no local disease could be detected outside of the genital organs; death resulted apparently from blood infection.

Buschke⁶ observed a case of *gangrene of the testicle* during the course of a mild gonorrhea in a robust man aged twenty-seven years. A bacillus resembling the colon bacillus was cultivated from the testicular tissues; no gonococci were found. He collected 16 similar cases from the literature. "As I have personally observed 2 such cases I am inclined to think it a more frequent occurrence than his article implies.

THE PRESERVATION OF THE SPERMATOGENIC FUNCTION of the testicle after occlusion of its duct though *epididymitis* has been studied by Posner.⁷ He punctured the testis with a Pravaz syringe and examined

¹ Berl. klin. Woch., 1905, No. 39.

² Münch. med. Woch., 1905, No. 36.

³ Brit. Med. Jour., June 24, 1905.

⁴ Wiener med. Klinik. 1906, No. 11.

⁵ Deutsch. Archiv. f. klin. Med., Band lxxxiii.

⁶ Deutsch. med. Woch., 1905, No. 38.

⁷ Berl. klin. Woch., 1905, No. 35.

the fluid withdrawn for spermatozoa in 17 cases. In 12 patients who had had epididymitis from seven to twelve years previously, spermatozoa were found in all but 2. In 5 patients where epididymitis had occurred between twelve and twenty-six years earlier, spermatozoa were found in only 1 case, in which seventeen years had elapsed since the occlusion of the epididymis.

THE RELATION OF GONORRHEA TO DISEASE OF THE SEXUAL ORGANS IN WOMEN is the subject of a valuable article by Dunning.¹ A careful investigation of his operative cases, public and private, showed that only about 13 per cent. of them could be fairly attributed to gonorrhea; and that in only about two-thirds of the 59 cases of sterility in women investigated, could a gonorrhea be accused with reasonable plausibility. He concludes that the usual ascription of a large majority of the pelvic diseases of females to gonorrhea, is a gross exaggeration of the facts; and that a large percentage of cases of gonorrhea in women recover quickly, leaving no trace, anatomical or functional.

While it is doubtless wiser for physicians to exaggerate than to minimize the remote evils of gonorrhea in both sexes, yet there can be no doubt that the current tendency is to be sensational rather than accurate in dealing with this question. I am inclined to think that Dunning's observations are nearer the actual facts than are the sweeping assertions so often heard from other teachers of gynecology who have not investigated the matter.

ANTIGONOCOCCUS SERUM. Torrey² has prepared a serum containing agglutinins and precipitins for the gonococcus. His clinical observations indicate that this has no appreciable effect upon the urethral discharge, but causes marked improvement in the various metastases of the gonococcus comprised under the term gonorrheal rheumatism.

Rogers³ employed Torrey's serum in eight cases of gonorrheal infection without uniform results; in most of the cases no distinct curative effect was observed, though in one instance marked benefit seemed to follow the use of the serum.*

Bactericidal Effects of Silver Compounds. Marshall and Neave,⁴ working for the Therapeutic Committee of the British Medical Association, made comparative tests of various silver compounds which are in clinical favor as to their ability to destroy various bacteria, including the ordinary atmospheric putrefactive bacteria, and pure cultures of the staphylococcus aureus. The diffusibility of these compounds was also tested, resulting in a demonstration of the decided superiority of argyrol in this respect.

¹ Jour. Amer. Med. Assoc., 1906, p. 1397.

² Ibid., p. 261

³ Ibid., p. 263.

⁴ Brit. Med. Jour., August 18, 1906.

It was found that the bactericidal powers of these various substances bears no relation whatever to their percentage of silver content. Thus silver fluoride containing about 82 per cent. of the metal, silver nitrate (64 per cent.) argentol (52 per cent.) protargol (7.5 per cent.) were nearly identical in their bactericidal effect; while collargol (87 per cent.) and, argyrol (20 per cent.) showed practically no germicidal power.

The last mentioned fact coupled with the undeniable clinical results generally obtained by the use of callargol and argyrol, shows that the clinical value of the silver salts is not determined by nor dependent upon the percentage of silver in the respective compounds.

Tuberculosis of the Epididymis and Testicle was treated in three patients, by Ullmann¹ through compression. The entire genitalia were surrounded by a rubber band by means of which pressure was maintained for one-half to one hour daily. He reports marked improvement in all the cases so treated.

The Prostate. The various operative procedures for the relief of *prostatic hypertrophy* have been the subject of many journal articles. It is gratifying to one who has persistently and consistently condemned the so-called perineal prostatectomy of the Vienna and Paris schools, to witness the adoption of this view by many operators who formerly warmly advocated this operation.

Thus in the stated discussion of prostatectomy at the Fifteenth International Congress of Medicine, Tuffier,² appointed to open the discussion, concludes that the suprapubic operation is in every way superior to perineal prostatectomy, except that its mortality is 5 or 6 per cent., while that of the perineal operation averages 4 per cent. He remarks that this greater mortality of the suprapubic operation is caused by infection of the pre-vesical tissues because of insufficient drainage. It is to be regretted that he failed to mention that this mortality has been reduced below that of the perineal operation by providing for the protection of the suprapubic wound against infection. This is accomplished by (1) draining the suprapubic space downward through the perineum; (2) by making the suprapubic operation in two stages—a method extremely valuable in feeble and elderly patients.

Bastos,³ the second participant in the same discussion, formulated the same conclusion as to the essential superiority of the suprapubic operation.

Legueu,⁴ speaking on the same topic, remarked that the suprapubic operation cures completely, while the perineal often fails to restore the

¹ Wien. klin. Woch. 1905, No. 47

² Annales des Maladies des Organes Genitourinaires, 1906, p. 691.

³ Ibid., p. 835.

⁴ PROGRESSIVE MEDICINE, December, 1905, p. 135.

vesical function; that the former leaves no unpleasant sequelæ, while the perineal furnishes a large number of cases of permanent fistulæ, urinary incontinence, cicatricial contractions of the vesical orifice, and minor distressing features; that the only objection to the suprapubic operation is the somewhat higher mortality from infection of the prevesical tissues—the means for preventing which Legueu, like Tuffier, seems never to have learned. Roux¹ is one of many who have abandoned perineal for suprapubic prostatectomy. In the past year he performed the latter operation on sixteen men over sixty years of age. One died, and in the remaining fifteen complete integrity of the vesical function was restored. The only undesirable sequel was a small fistula in one patient, which was subsequently closed by operation.

Duval² did a suprapubic prostatectomy in a man aged fifty-six years; and closed the wound in the prostate by loosening the mucous membrane of the membranous urethra and suturing it to the vesical mucous membrane; the result was satisfactory.

This seems, as Legueu remarked in the discussion, a refinement of finish which is not only needless but dangerous, for it adds not merely to the time of anesthesia, but also increases the raw and poorly drained surfaces through which septic infection may occur. The theoretical advantages—covering of the raw prostatic surfaces with mucous membrane—are nullified by the well known certainty and rapidity with which the vesical epithelium is extended over such surfaces.

In the discussion of this subject in the review of last year the serious defects of perineal prostatectomy were mentioned, and the conclusion expressed that the suprapubic should supplant the perineal as the routine procedure. It is gratifying to note that the universal trend of opinion now concurs with this conclusion.

It is further important that the various morbid conditions causing urinary retention in elderly men should be recognized and differentiated; there is a general disposition to consider all such cases as due to prostatic hypertrophy, and to submit them to prostatectomy. This subject I have discussed recently.³ I first recalled the various conditions independent of the prostate which result in cystitis and which are frequently overlooked because of the general habit of associating all bladder troubles in elderly men with prostatic hypertrophy; prominent among these are vesical calculus, carcinoma and papilloma, and locomotor ataxia.

The diseases of the prostate which cause bladder troubles are four: sclerosis, pus infection, hypertrophy (adenoma) and carcinoma.

SCLEROSIS OF THE PROSTATE is frequent without enlargement of that organ; indeed, the prostate may be smaller than normal. The successful

¹ Centrbl. f. Chir., 1906, p. 28.
Illinois Medical Journal, 1906, p. 157.

² Société de Chir., July 4, 1906.

surgical treatment is not prostatectomy because this fibrous prostate cannot be enucleated, as experts like Freyer and Albarran acknowledge; the treatment consists in channelling a canal through the fibrous vesical orifice by means of the galvanocautery introduced through a median perineal urethrotomy. The ordinary cautery knife has been used for this purpose for twenty years and meets all requirements; a few years ago Chetwood devised an elaborate and expensive knife for the same purpose.

PUS INFECTIONS OF THE PROSTATE AND VESICLES are frequent in men of middle and advanced age. They produce the symptoms commonly ascribed to cystitis, together with inflammatory swelling (but not hypertrophy) of the prostate. They do not demand prostatectomy—in fact are often not relieved by it. These are the cases that were formerly improved by castration or even vasectomy; but are also relieved by massage of the prostate and vesicles, injection of the prostatic urethra with silver nitrate solutions and the passage of large sounds; and injecting the vesicles from the vas deferens.

HYPERTROPHY (ADENOMA) OF THE PROSTATE is present in many cases of cystitis in men over fifty-five years of age. Prostatectomy—the enucleation of the adenomatous masses—should be performed when practicable through a median perineal urethrotomy. This operation is feasible in perhaps half the cases requiring surgical interference; but when the median lobe is very large, the suprapubic incision is preferable. If the patient's condition—debility, renal disease—makes infection of the suprapubic space probable, this danger can be minimized by performing the operation in two steps—the first incision extending to, but not through the bladder, the second made four or five days later, opening the bladder. A metal tube introduced through a median perineal urethrotomy, allows the suprapubic wound to drain into the bladder instead of the bladder into the suprapubic wound—which latter usually occurs in the ordinary suprapubic cystotomy.

Perineal prostatectomy—in which the posterior surface of the prostate is exposed and opened, and the perineal muscles replaced by cicatricial tissue—should be abandoned because of its frequent unfortunate sequelæ namely: incontinence, permanent fistulæ, and cicatricial contraction of the vesical neck.

CARCINOMA OF THE PROSTATE is unfortunately common and usually mistaken for simple hypertrophy. According to our present knowledge about one out of every ten cases of “prostatic enlargement” in men over fifty is cancer; the younger the patient who presents a hard enlargement, the greater is the chance of cancer.

The treatment of prostatic cancer by extirpation has as yet been successful merely in shortening the patient's suffering. Symptomatic treatment usually assures a fairly comfortable existence. Surgical aid

seems at present best limited to providing a suprapubic exit for the urine in those cases in which the natural exit is obstructed by the growth or in which urination is painful and frequent. It is the usual practice to secure this artificial exit by means of suprapubic cystotomy. A much safer and simpler method is puncture with a small trocar and cannula; a small soft catheter is introduced through the cannula which is then withdrawn, leaving the catheter to drain the bladder. After three days (when the fistulous track is firmly walled in) the catheter is removed, cleansed, and reintroduced. Thereafter, the removal, cleansing, and return of the catheter and washing of the bladder can be performed by the patient himself.

As calculi often form in these bladders it is desirable to inspect the vesical interior to detect their presence; often the cystoscope cannot be introduced through the prostatic urethra because of the cancerous growth. In such cases a straight cystoscope can be introduced through a suprapubic cannula at the time the puncture is made. All this can be done without any anesthetic or under nitrous oxide narcosis.

Carcinoma of the prostate is discussed by Hallopeau¹ in a Paris thesis. He has collected 90 cases from the literature and from personal observation in Guyon's service at the Necker Hospital.

He finds 1 in 10 cases of prostatic hypertrophy in elderly men cancerous; though in some the cancerous features develop—at least are recognized—only some time after the hypertrophy has been noted.

The growth develops especially at the upper and posterior border of the prostate extending along the external border of the seminal vesicle; it invades the bladder often; the urethra rarely. Diffuse prostatopelvic carcinosis is rare, metastases in bones common. Early diagnosis is difficult and hence successful surgical treatment unusual.

Operative Results. In 20 of 43 cases in which extirpation was undertaken death followed immediately upon the operation. Of the cases recovering from operation, 1 has survived four years, and 1 five and a half years; 2 show no recurrence at two and two and one-half years respectively; the remainder showed prompt recurrence.

Young² reports 6 cases of prostatic carcinoma operated on by a method of his own devising. There was 1 operative death, while 3 patients are living ten, eight, and one month respectively after operation.

METASTASES OF PROSTATIC CANCER IN BONES is an early and frequent feature of the disease, which must be reckoned with in estimating the chances of cure, even if the prostatic neoplasm be completely extirpated. This subject is discussed by Fischer-Defag,³ who reports upon the post-

¹ *Annales des Maladies des Organes Genitourinaires*, 1906, p. 796.

² *Jour. Amer. Med. Assoc.*, 1906, p. 699.

³ *Zeit. f. Krebsforschung*, Band iii, No. 2.

mortem findings in the Dresden hospital. Metastases are found in the spine or the femur in 25 per cent. of all cases of prostatic cancer, and often in other bones, though seldom diagnosed during life. The spleen is seldom involved.

Syphilis of the Prostate. Drobný¹ observed a man, aged thirty-two years, who presented the usual symptoms of chronic pus infection of the prostate, including enlargement, without pus in the urine or previous gonorrhea. He had contracted syphilis twelve years earlier. Suspecting that the enlargement was of syphilitic nature, Drobný gave intramuscular injections of mercury salicylate; the prostatic disease and enlargement promptly disappeared, though no local treatment was used. From this result Drobný feels justified in considering the prostatic lesion a diffuse gumma.

It must be said of this as of various similar cases reported in which antisyphilitic treatment has been promptly followed by a restoration of the normal state, that the inference of cause from effect is not justified. There seems to be as yet no direct evidence from microscopic examination of the prostate, removed either antemortem or postmortem, that this organ exhibits manifestation of the syphilitic virus.

The Cure of Hydrocele has been discussed by myself.² I have had made a specially devised trocar and cannula whose distinctive feature is a window in the centre of the cannula.

The cure of hydrocele by injection with carbolic acid has obvious advantages over the various cutting operations. Its serious defects have been (1) uncertainty of a cure, and (2) unintentional injection of the acid into the scrotal tissues. The first of these—recurrence—results from failure to destroy the serous surface and this failure results, in turn, from the incomplete removal of the albuminous hydrocele fluid, a layer of which adheres to and protects the serous surface from the caustic effect of the acid.

These defects are remedied by the use of my instrument in the following way: The distended scrotum is transfixed from above downward (or conversely); after withdrawal of the trocar and escape of the hydrocele fluid, the lower end of the cannula is closed by the cap and the sac is distended with warm salt solution injected through the upper end. Removal of the cap allows the fluid to escape and this flushing of the sac is repeated until the escaping water shows only a trace of albumin by the nitric acid test (usually two flushings suffice). The cap being replaced pure carbolic acid is injected into the sac, the quantity varying from 5 to 25 c.c., according to the original capacity of the sac. The scrotum is manipulated so as to secure contact of the acid with the entire

¹ *Semaine médicale*, 1906, p. 404.

² *Jour. Amer. Med. Assoc.*, April 7, 1906.

sac, after which the acid is allowed to escape. Alcohol is then injected to neutralize any residual acid and to limit its action. A minute or so later the alcohol is allowed to escape, the cannula withdrawn, and the punctures sealed. The fluid which refills the sac in the next few days will be absorbed; but if the tension is great, it is better to remove this fluid by a simple puncture. Confinement to the house is usually unnecessary, especially if the sac be small.

When the sac is large it is better simply to withdraw the fluid at the first sitting and to inject the acid and alcohol after the sac refills.

This method, employed in seventeen cases without recurrence, seems to offer all of the good and none of the evil features of the various cutting operations for simple hydrocele.

Congenital Stricture of the Urethra in the male is the subject of a monograph by Foisy.¹ He has collected one hundred and four cases described in the literature. He classifies them as (1) annular, composed of fibrous tissue surrounding the urethra; (2) diaphragmatic, a circular fold of mucous membrane, the opening being ordinarily central; (3) valvular, a fold of mucous membrane obstructing a lateral portion of the canal; (4) fibrous dams occluding the urethra.

They cause the lesions in the upper urinary channels which are usually consecutive to acquired urinary obstructions. They are frequently associated with other malformations, such as hypospadias.

Congenital strictures arise chiefly from incomplete absorption of the tissues which originally separate the sections of the urethra, three in number, in which this canal is developed. The junction of the glandular with the cavernous urethra, just back of the meatus, and the junction of the bulbous with the membranous portion, are the sites of these natural barriers, and, therefore, usually of congenital strictures.

While the fibrous strictures are detected and removed by the methods usual in acquired strictures, the valvular obstructions have been found usually by operation or autopsy.

Excision of the Seminal Vesicles has been performed by Riese² in seven cases through a transverse incision in the perineum. In five tuberculous cases the patients were restored to health, though there was tuberculosis of the lungs in each. These recoveries have been maintained over five years.

Irrigation and Drainage of the Seminal Duct and Vesicle is a distinct advance in the treatment of the diseases of the seminal canal, devised by me.³

The vas deferens can easily be brought by the fingers against the skin of the scrotum and held there by a half-curved needle passed through

¹ Roussett, Paris, 1906.

² Deutsch. med. Woch., Band xxxii, No. 25.

³ Proceedings American Association of Genitourinary Surgeons, 1906.

the skin under the vas. A half-inch incision through the skin and envelopes of the spermatic cord—painless under local anesthesia—exposes the vas. A transverse or longitudinal incision into the vas opens its canal. The blunted needle of a hypodermic syringe can be passed into this minute canal and a watery solution of any desired agent injected; this liquid traverses the vas and the ampulla, and distends the seminal vesicle.

This operation, and its utility in the treatment of gonorrheal and other pus infections of the seminal vesicle, were presented by me to the Chicago Medical Society and described in the *Journal of the American Medical Association*, April, 1905. Further experience has improved the procedure and widened its scope. When deemed necessary, the vas is stitched to the skin by a fine silkworm gut suture which passes through the lumen of the canal at each cut surface. Thus a fistula is maintained so long as desired, and through this fistula the vas and vesicle may be injected daily. Moreover, the vas serves as a drainage tube for the ampulla, which drainage may be facilitated by passing a fine silkworm or horsehair thread along the vas to the ampulla, where it is left until removed for the next injection.

By this procedure direct, repeated, and successful medication of the vas, ampulla, and seminal vesicle is for the first time made possible, and without a serious operation. I have usually done the operation in my office, often unassisted, the patient walking away at its conclusion and losing no time from his vocation.

Irrigation and drainage of the seminal duct and vesicle I have found to be invaluable in the treatment of the following conditions:

1. Chronic gonorrheal infections of the seminal canal (vesiculitis), with or without a gleet discharge.

2. Chronic pus infections of the seminal canal in the middle-aged and elderly (usually mistaken for enlarged prostate).

3. Recurrent epididymitis, which results from repeated invasion of the epididymis by an infection persistent in the seminal vesicle or deep urethra.

4. Acute gonorrheal spermatocystitis; in this condition and in other severe infections, incision into the vesicle from the rectum with the galvano-cautery is sometimes desirable for the immediate relief of severe symptoms. Liquids injected into the vas then escape into the rectum.

5. In two cases of acute gonorrhea which presented the symptoms usually preceding extension to the epididymis, including pain and tenderness in the inguinal canal, the vas was opened and injected with argyrol solution. No epididymitis occurred; but further experience must determine the possibility of averting gonorrheal epididymitis by this simple procedure.

In one case of tuberculosis of the epididymis, vesicle, and prostate the vas and vesicle were irrigated with carbolic acid solution—after Rovsing's method for vesical tuberculosis—without appreciable benefit.

The first injection into the vesicle should not exceed 30 minims; a larger amount may cause painful contractions of the vesicle—spermatic colic—and retention of urine, both of which effects I witnessed in my early work. As the inflammatory swelling subsides, the subsequent injections may be carefully increased in quantity.

When complete division of the vas is deemed wise, end-to-end anastomosis is easily made, by running a fine silkworm suture through the lumen of each cut end through the skin and tying loosely outside. The lumen of the vas is thus maintained during healing. The fistula made for treatment is closed in the same way.

The infections of the seminal vesicle and vas constitute a neglected field; for the symptoms caused by spermatoecystitis—pyuria, frequent and painful urination, even complete retention of urine—are generally referred to the bladder and the prostate, and treated as cystitis and prostatitis. If the subject be above forty years of age—and spermatoecystitis is common after that period—he is charged with harboring an enlarged prostate and advised to submit to prostatectomy. These are the cases that were temporarily benefited by resection of the vas deferens, when that operation was popular.

By my method these very important, because very common, ailments are made amenable to treatment without danger to the patient or to his sexual function. It is well known that even complete occlusion of both seminal canals, as by double gonorrheal epididymitis, does not impair sexual desire or capacity, though preventing the passage of spermatozoa into the urethra; and my operation does not even occlude the vas.

The suppurating seminal vesicle has been exposed and drained through an extensive perineal incision similar to that for perineal prostatectomy. This operation, first practised by Dittel and recently modified by Fuller, is severe and bloody, entailing risks and requiring weeks of confinement; it seems justified, if at all, only in cases of perivesiculitis. The method that I have devised, with or without a cautery incision from the rectum, suffices for the treatment of the vesicle, as well as the ampulla and vas.

DISEASES OF THE KIDNEYS.

By JOHN ROSE BRADFORD, M.D.

Renal Decapsulation and Nephrotomy in the Treatment of Severe Forms of Eclampsia. Chambrelent and Pousson communicated to the Academy of Medicine in December, 1905, a communication on the above subject and Pinard reports on it as follows: The author considers that eclampsia is dependent on the presence in the blood of a toxic substance of unknown nature and that in addition to this, renal and hepatic lesions are present so that two of the most important excretory organs are at fault and the toxemia is thereby aggravated. They consider that in addition to the ordinary medical treatment the more severe cases of eclampsia should be relieved by surgical measures and that these are especially indicated when the quantity of urine excreted is very small with a great diminution in the excretion of urea and other extractives, and also when a high degree of albuminuria is present. They also regard the existence of urinary changes characteristic of acute nephritis as an indication for surgical interference.

Edebohls has used decapsulation of the kidney in the treatment of two cases of eclampsia, but the French authors recommend decapsulation combined with unilateral nephrotomy. They record a case of a primipara, aged twenty-one, where the albuminuria was absent until two days before labor, and then was only present in traces. Notwithstanding this severe eclampsia developed associated with partial suppression of urine which was poor in urea and salts and contained a large quantity of albumin. Decapsulation was performed on both sides and the kidney incised on the right. The operation was followed by marked improvement, and by the third day all the eclamptic symptoms had entirely disappeared. Chambrelent and Pousson found that in this case an acute nephritis of both kidneys was present of a parenchymatous type, but the glomeruli and the interstitial tissue were also affected to some extent. The authors point out that such a case proves the existence of an acute nephritis associated with eclampsia, inasmuch as a portion of kidney was removed during the operation and examined, and that, therefore, the slight lesions described by other writers as associated with acute eclampsia are really pathological, and not, as has been asserted by some, mere postmortem changes. They conclude, secondly,

that the nephritis subsided as a result of the operation on the kidney and the urinary flow was re-established.

Chambrelet and Pousson draw attention to the fact that Reginald Harrison was the first to use nephrotomy in the treatment of acute nephritis as a means of relieving the tension produced by the acute congestion. It is possible that the effects of this tension on the renal elements are somewhat analogous to that seen in glaucoma or to the destructive processes occurring in the testicle as a result of orchitis. In all these cases the tension produced by the inflammatory process is able to cause serious destructive effects, owing to the organs being bounded by a tense capsule.

Nephrotomy further aids the process of recovery, owing to the free hemorrhage relieving the renal congestion and so promoting the establishment of the urinary flow.

The French authors consider that it is essential not only to decapsulate the kidneys but also to relieve the congestion by means of a free incision into the kidney substance, as according to them this in no way increases the gravity of the operation.

The operative procedures not only produce effects on the course of the nephritis, but in addition lead to the re-establishment of the secretory functions of the kidneys. The increase of the renal tension affects notably the excretory activity of the kidney, and this shows itself especially by the scanty excretion of urea and other products of excretion. The operation is followed by a rapid increase in the total quantity of urine and of urea and of salts, and according to the writers this improvement is frequently extremely rapid in its occurrence.

Lastly, it would seem that nephrotomy may have a beneficial effect not only on the course of the lesions and the urinary flow but also on the toxemia. The nephrotomy not only leads to the withdrawal of a certain quantity of blood, but this blood is derived directly from the kidney, and it is, therefore, possible, in the opinions of Chambrelet and Pousson, that it is more especially charged with toxic elements derived directly from the kidney.

Pinard in his report considers that these operative procedures are of great value in the treatment of cases of eclampsia complicated by anuria. It must, however, be borne in mind that anuria may occur in the puerperal woman without the occurrence of eclampsia. Several cases have now been recorded where complete anuria has occurred after labor without the development of any eclamptic phenomena and with clinical symptoms precisely similar to those seen in calculous obstruction. The first case of this kind was recorded by Bradford and Lawrence,¹ and a recent one of a precisely similar character has been described by Griffith

¹ Journal of Pathology, vol. v, p. 197.

and Herringham. Thus anuria may be associated with and dependent on thrombosis of the renal arteries followed by a necrosis of the cortex, and such a condition could not be relieved by decapsulation and nephrotomy, and would seem to be inevitably fatal, as the resulting lesion is equivalent to the removal of both kidneys. Hence, anuria cannot be taken as the sole indication for operative interference. It may well be, however, that eclampsia associated with anuria, as Pinard suggests, may be regarded as such an indication if the ordinary medical measures for the relief of this condition are not followed by prompt success.

Griffith and Herringham¹ record a case of necrosis of the entire renal cortex of both kidneys, together with thrombosis of all the cortical arteries occurring in the puerperal state. The patient was aged thirty-five years, and had formerly been under treatment for chronic nephritis. She had had several confinements, and during the last four pregnancies the renal symptoms had become worse. She was delivered of a dead child on March 2, 1905, and there were no abnormal symptoms connected with the uterus. The next day there was suppression of urine, half a dram only being obtained by a catheter, and slight edema of the face and conjunctiva were present. She lived until March 12, and during the last six days of life there was complete suppression of urine, and from the onset of symptoms until death only ten ounces were passed. The patient presented no symptoms of ordinary uremia, but complained somewhat of headache, and vomiting occurred from time to time. The temperature varied between 98° and 101° F. The edema of the face and eyes was exceedingly slight and had passed off by March 7, and no edema developed in any other part of the body. During the last five days of life there were scarcely any symptoms. Vomiting was very slight in amount, and notwithstanding the complete suppression of urine no other signs of uremia developed. On the ninth day of the suppression the patient became slightly delirious and died. The blood pressure on the day before death was 140 m. in the brachial artery, and the heart showed signs of slight enlargement, and retinal changes were present. At the postmortem examination universal necrosis of the cortex of both kidneys was present. None of the nuclei were stainable, and the outline of the cells was only in parts distinguishable and their substance was granular, the lumen of the tubules was filled with irregular masses. The glomeruli also showed necrotic changes and did not stain, the interstitial tissue was much increased in amount, and like the parenchymatous it did not stain. The most striking change was in the arteries, the large vessels in the zone dividing the medulla from the cortex stained readily, but all the vessels running outward from these trunks had lost the power to

¹ *Journal of Pathology*, vol. xi, p. 237.

stain. The interior of all the vessels was occupied by a thrombus. In many places this was solid, in others partly broken up. There was no clear evidence of the existence of any endarteritis, with the exception of one interlobular vessel, where there was distinct evidence of this condition. The authors are inclined to think that endarteritis was not present to any marked degree, although they admit that in many cases the loss in the staining power made it difficult to distinguish between the outer part of the thrombus and the inner wall of the artery. The veins in the cortex were natural, and in the medullary portion of the kidney the tissues stained well; many of the tubes contained hyaline plugs and the interstitial tissue was not increased. The kidneys presented the same appearances on both sides; the right weighed eight and one-half ounces and the left seven and one-half ounces. No abnormality of the renal arteries were present, and the ureters were natural and no obstruction existed.

This case is of great interest and is the counterpart of a case published by Bradford and Lawrence.¹ Here also suppression of urine occurred in a woman aged thirty-six years, who was delivered of a dead child, and the suppression lasted seven days without the production of any uremia. The kidneys presented to the naked eye the same appearance as those described in this second case, and microscopically showed general arterial thrombosis and necrosis of the parenchyma. In Bradford's case there was no chronic nephritis, but extensive endarteritis. In the present case endarteritis was absent, but chronic nephritis was present, otherwise the cases were identical.

The great importance of these instances of what must be a very rare kidney disease lies in the fact that the lesion is of such a character and is produced with such suddenness as to be equivalent to the complete removal of both kidneys. In this way an opportunity is afforded of observing in the human subject the results of a lesion comparable to that produced by double nephrectomy in animals. The phenomena produced are very similar in the two cases with the remarkable exception that the duration of life in the human subject is considerably longer than that seen after experimental double nephrectomy. In the latter condition animals usually die on the third or fourth day. Herringham's case lived nine days and Bradford's seven days. The point of most importance, however, is the fact that in neither of these cases, notwithstanding the complete cessation of the renal functions, were any symptoms analogous to uremia present. The clinical picture in the human subject is similar to that seen as a result of calculous obstruction, a condition which is rarely recognized but of great importance.

¹ *Journal of Pathology*, 1898, vol. v, p. 197.

Two deductions of importance can be drawn from these facts: one is that the removal of the kidneys, or at any rate the cessation of the functions of the kidneys, does not necessarily lead to the production of uremia even when this cessation of function is the result of the complete arrest of the circulation through the kidney, and secondly, that the clinical picture associated with calculous obstruction in the human subject, and supposed to be pathognomonic of it, may also arise in other conditions, and even in such a lesion as that present in these cases where the functions of the kidney were totally arrested. The absence of uremia in calculous obstruction and its presence in renal disease, acute and chronic, has often been used as an argument in favor of the existence of an internal renal secretion and in support of the view that uremia was really dependent on the arrest of this secretion. In these two cases of complete obstruction of all the renal arteries in both kidneys with complete necrosis of the cortex of both kidneys, the absence of uremia, notwithstanding the prolonged survival of the patients, would seem to be conclusive against the view that arrest of an internal secretion is the cause of uremia. Thus, these cases of cortical necrosis arising in the puerperal state are of considerable interest both from the theoretical standpoint of the pathology of uremia and also from the clinical standpoint of the diagnosis of obstruction of the ureters from calculous or other disease.

Diet in Postural or Functional Albuminuria. Functional albuminuria is a condition of great importance to all practitioners, both from a point of view of diagnosis and of treatment. Certainly, it would seem at the present time that many of these cases are submitted to far more rigorous treatment, especially in diet, than is necessary. Although it is possible that some but only a limited number of cases of functional albuminuria are dependent on diet, it is undoubted that the great majority of these cases are really to be looked upon as instances of postural albuminuria, and where this is the case the quantity of albumin is but little influenced by dietetic measures. Dufour¹ is of the opinion that it is not necessary in cases of *scarlet fever* to restrict the diet in the manner that has hitherto been the custom, and further, that a solid diet may not only be given in the later stages of scarlet fever but also in those cases where in addition to the scarlet fever postural or orthostatic albuminuria is present. He quotes the case of a child nine years of age where postural albuminuria was present prior to the onset of scarlet fever, the amount of albumin was considerable but was only present in the upright posture. Ten days after this condition was discovered the child suffered from an attack of scarlet fever, but the albumin disappeared as the result of the child being confined to bed. From the second day the diet was increased, eggs

¹ Soc. Méd. des Hôp. de Paris, February, 1906.

being allowed, and on the third day meat was given but no salt was allowed until the eighth day. The convalescence was uninterrupted and there was no return of albuminuria until the child was allowed to get up, and subsequent to the illness the albuminuria reappeared with the same postural characters that had existed prior to the onset of the scarlet fever.

This case, as Dufour points out, may possibly throw doubt on the commonly accepted belief that postural albuminuria is frequently the sequel of scarlet fever, inasmuch as in this case it was known to precede the condition; but had this fact not been ascertained the history of the child in subsequent years would probably have led to the view that the albuminuria resulted from the scarlet fever. In the discussion that followed this communication of Dufour several authors mentioned the fact that postural albuminuria sometimes disappeared as a result of the patient suffering from some febrile illness and even after scarlet fever. Legendre quoted a case of postural albuminuria that was watched for several years in a young man who had not suffered from any infective disease and where the albuminuria entirely disappeared subsequently to an attack of scarlet fever. Another case was quoted where an albuminuria that had existed for ten years disappeared subsequently to an attack of severe pneumonia.

Considerable doubt still exists as regards the exact nature of postural albuminuria and in the above discussion Linossier contributed some information on this subject. He considers as the result of a number of observations that the renal secretion is not carried on so favorably in the upright as in the recumbent posture, and that the excretion of a number of substances like methylene blue and iodide of potassium is not so rapid in the upright as in the recumbent posture. This disturbance of the function of the kidney which can be detected even when the organ is normal is still more obvious when the functions of the kidneys are impaired. Linossier considers that three types of conditions may be recognized. In the first form, where the kidneys are quite normal, the only effect of the upright posture on the renal secretion is to lead to a diminution in the quantity of water excreted, and according to him there may be a diminution of 20 per cent. In the second group of cases where there is some deficiency in the excretory activity of the kidney as a result of previous infection or owing to the action of some toxic substances, such as lead or alcohol; but without the presence of obvious organic disease of the kidney the upright posture causes a still greater diminution in the excretion of water, and Linossier states that in some cases there may be a diminution amounting to 70 per cent. He considers that this diminution in the quantity of water excreted may be looked upon as one of the most delicate signs of renal inadequacy. This great

diminution in the excretion of water is associated with a diminution in the excretion of the solids of the urine and especially of the urea. In the third group of cases where the renal inadequacy is still greater the upright posture causes the development of albuminuria. Linossier considers that the disturbance of the function of the kidneys in the upright posture may be due to slight torsion of the renal pedicle and thus the production of a certain amount of venous congestion. This view of the pathology of postural albuminuria is very plausible, but it fails to meet the well-known fact that such albuminuria not uncommonly disappears in the late afternoon. This is the one fact that militates against all purely mechanical views since it is difficult to understand why the condition should diminish toward the evening if the effects are simply dependent on gravity or on such a phenomenon as torsion of the renal pedicle. Some writers have also objected that if the albuminuria were entirely of mechanical origin this postural character should also be a marked feature of the albuminuria of organic disease but it may well be that the albuminuria of organic disease is so marked that the influence of posture could scarcely be recognized. Certainly in some forms of organic disease, and especially granular kidney, where the albuminuria may be very slight in amount, the postural phenomenon may be present. On the whole it may be concluded that the presence of postural albuminuria is really a sign of a slight latent lesion of the kidney and that it may be present not only in cases presenting no signs of organic disease but also in others where a nephritis, epithelial or interstitial, but slight in amount, is present.

The pathology of functional albuminuria is still unfortunately obscure and a number of writers look upon the condition as dependent on the existence of a slight lesion often produced by some previous febrile illness, especially scarlet fever and other infective disease. No doubt the mere fact of the patients having previously suffered from scarlet fever is sometimes looked upon as sufficient proof that the albuminuria had this origin. Lenoir¹ draws attention to the fallacy of this reasoning and records cases of postural albuminuria not only with no antecedent history of any infective disease but other cases where the albuminuria was known to exist before the onset of such an acute specific as scarlet fever and where the scarlet fever or other infective disease has not led to any increase in the albuminuria. In some instances indeed the rest in bed instituted by the acute illness has led to the disappearance of the albuminuria so long as the patient remained in bed, but it has reappeared during convalescence so soon as the upright posture has been resumed. In several of Lenoir's cases where the functional albuminuria had been

¹ *Bulletins et Mémoires de la Société Médicale des Hôpitaux de Paris*, No. 5, February 15, 1906.

attributed to the previous attack of infective illness there was conclusive evidence to show that during that illness no albuminuria had existed. It would certainly seem that a considerable number of cases do not owe their origin to any former attack of nephritis. Lenoir records that in two instances he was able to observe the development of functional albuminuria, as these patients' urines had been frequently examined and found normal. In one instance the albuminuria developed as a result of excessive fatigue and in the other case as a sequel to the onset of menstruation. The latter case was of some interest inasmuch as the child subsequently contracted scarlet fever and typhoid fever and throughout the course of both these infective diseases the urine contained no albumin but subsequent to convalescence the albuminuria reappeared.

Lenoir points out that his cases show how the albuminuria of functional albuminuria is mainly influenced by posture and how little it is influenced by food or even by the occurrence of febrile diseases that may themselves give rise to albuminuria. Further, that the prognosis of functional albuminuria is good and that neither the general health nor the course of intercurrent maladies are affected in a prejudicial manner. Lastly, it is not necessary to order any special diet for these cases and that it is wiser to order a liberal than a restricted diet.

Paroxysmal Hemoglobinuria. Eason¹ records a series of observations and experiments on the pathology of paroxysmal hemoglobinuria. In this malady the excretion of blood pigment in the urine is associated with the destruction of large numbers of red blood corpuscles in the systemic circulation and in severe attacks a high degree of anemia may be produced owing to disintegration of the blood corpuscles.

It has long been known that a number of substances were capable of causing hemoglobinuria by acting on the red blood corpuscles and liberating the hemoglobin into the blood stream, in other words by laking the blood. The suggestion had, therefore, been made that in paroxysmal hemoglobinuria the results were due to the action of some such substance. All the phenomena of the disease, including the urinary changes, could be accounted for on the supposition that the fundamental result was the liberation of hemoglobin in the blood stream. The observations of Eason on cases of the disease show that a pathological substance is present in the blood serum and blister fluid of the affected patients: this hemolysin can dissolve not only the corpuscles of the affected individual but also those of normal individuals, thus proving that the disease is not dependent on any primary change in the blood corpuscles themselves. One of the most striking phenomena in paroxysmal hemoglobinuria is the fact that the attack is usually brought on as the result of exposure

¹ Edinburgh Med. Jour., vol. xix, p. 43, and the Jour. of Path. and Bact. vol. xi, No. 2.

to cold and attacks can sometimes be induced in susceptible patients suffering from the disease by the exposure of a part only of the body to such cold. Eason's observations show that the action of the hemolytic substances present in the blood serum of patients is greatly influenced by cold.

The researches of the Ehrlich school have shown that hemolytic poisons consist of two groups of substances, the intermediary body or immune body and the complement, and that both these are necessary for the hemolytic action to be produced. The intermediary or immune body becomes anchored, according to the well-known Ehrlich hypothesis, to the red corpuscle and then subsequently the action of the complement leads to the hemolysis. In paroxysmal hemoglobinuria it would seem that in order for this anchoring process to take place the action of cold is necessary, but the serum of patients suffering from paroxysmal hemoglobinuria does not produce hemolysis if the action on the corpuscles is limited to the cold period in other words, although the anchoring of the immune body to the corpuscle can be shown to be produced whilst exposed to cold the action of the complement in finally bringing about the hemolysis requires the body temperature. The action of the complement in finally bringing about hemolysis cannot be affected at a low temperature.

Observations performed by mixing the serum of patients with blood corpuscles in the cold show conclusively that there are these two components in the toxin and that one of these is absorbed by the corpuscles in the cold, but no solution of the corpuscles takes place unless these are allowed to remain in contact with the serum subsequently at the temperature of the body. The complement substance is also present in non-hemolytic sera, as for example in the normal human serum, but the intermediary body or amboceptor is only present in the serum of patients suffering from the disease. Eason would seem to be of the opinion that the limitation of a paroxysm may be dependent simply on the existence of unfavorable temperature conditions which do not favor the anchoring of the amboceptor to the red cells. Thus it would seem that the paroxysms are not necessarily caused by the development of a toxic substance during the exposure to cold but by the toxin always potentially present in affected individuals becoming active during exposure to cold. The toxin may not only be found in the blood serum of affected patients but also is readily obtained from blister fluid and a great number of Eason's observations were carried out with such blister fluid.

Although there is clear evidence of the existence of this toxin in the blood of patients suffering from paroxysmal hemoglobinuria there is no such clear evidence as to the mode of its production. Eason discusses the possible relation of traumatic hemoglobinuria to the paroxysmal

variety of the disease, but although there can be no question that cases are occasionally seen of traumatic hemoglobinuria, yet these are very rare and there is no evidence that patients suffering from the paroxysmal form of the disease have suffered from traumatic hemoglobinuria previously.

Eason sums up the principal conclusions with reference to the disease as follows: cold and fatigue may excite paroxysms in individuals affected with the malady; atmospheric cold probably causes a reduction of the temperature at any rate in the peripheral circulation sufficient to permit of the union of the intermediary body or toxin with the red corpuscles. This of itself as already explained does not lead to hemolysis, but this hemolysis is brought about as the result of the further action of the complement, and this action is promoted by a higher temperature and occurs most probably when the blood returns to the central organs. The complement, it will be remembered, is present in normal human serum; it is only the intermediary body or amboceptor that is the specific toxin, the nature of which is not yet ascertained, and is only present in the blood of patients suffering from the malady. It would thus appear that cold is an essential preliminary to all paroxysms. It is possible that fatigue may also be a factor of some importance in the etiology of the disease, since fatigue plays a large part in the production of hemoglobinuria in horses and the equine disease is closely analogous in many respects to the human variety.

Malaria and syphilis cannot be excluded as possible sources for the production of the hemolysin, but although these affections are noted not uncommonly in patients suffering from paroxysmal hemoglobinuria yet this disease may occur without the previous occurrence of either syphilis or malaria. Hemoglobinuria may follow a traumatic effusion of blood, and it is possible that it may result from the formation of an intermediary or antibody which acts not only on the effused blood but also on that in the circulation of the individual. Eason points out that this supposition has not been experimentally proved, but Metchnikoff and others have succeeded in obtaining an autotoxin in the case of spermatozoa. There is not, however, sufficient evidence to show the direct etiological relation, if any, between trauma and paroxysmal hemoglobinuria.

In addition to the presence of blood pigment in the urine, there are other changes in this fluid during the paroxysms. The ratio of urea nitrogen to total nitrogen is much altered so that it may increase from the normal 84 per cent. preceding the paroxysm to some 99.6 per cent. during the paroxysm. It is possible that this alteration is dependent on the metabolism of xanthin and uric acid being much reduced. The phosphorus excretion is also reduced, together with the normal urinary pigments, and in some instances the latter may be entirely absent during

the paroxysm. It would seem from these results that the activity of the liver is considerably diminished during the paroxysm.

The toxicity of the urine is also diminished but the urine apparently does not contain any special toxic substance.

Eason has also conducted a series of experiments with the view of producing if possible an antitoxic serum for the treatment of the disease. As yet this serum has been prepared on so small a scale as only to permit of experiments *in vitro*, that is to say, the serum has been added to the toxin and has neutralized its hemolytic action. Eason prepared the antitoxic serum by injecting guinea-pigs with serum obtained from individuals suffering from paroxysmal hemoglobinuria. This serum apparently possesses the property of preventing the production of the hemolysis which otherwise would be produced not only by the particular serum used in injecting the guinea-pig but also the hemolysins present in the serum of other cases of the same disease. He concludes by stating that these experiments suggest that the toxin may be identical in all cases of paroxysmal hemoglobinuria and that such antitoxic serum might be employed in the treatment of the disease.

Uremia Associated with Cystic Kidneys. Uremia varies greatly in its clinical forms and these would sometimes seem to be dependent on the nature of the underlying renal disease. It is well known, for example, that in eclampsia renal manifestations are usually of the epileptiform type and as mentioned above in cases where the circulation through the kidney is arrested and complete suppression results ordinary uremic manifestations are totally absent and the patient presents a clinical picture indistinguishable from that seen in calculous obstruction. Further, in cases of renal disease secondary to cystitis and where the renal lesion is pyelonephritis or consecutive nephritis, the symptoms of uremia are also very characteristic. In such patients delirium of slight severity together with hiccough and some vomiting are usually the most marked features of the grave complication that has supervened.

In the renal lesions that are most frequently associated with uremia, viz., acute nephritis and certain forms of renal cirrhosis there is perhaps more uniformity in the clinical symptoms present. If the uremia is of the acute or fulminating type dyspnea is a most constant feature and usually such patients become drowsy and ultimately comatose; in some, however, epileptiform seizures occur from time to time, and these are more especially associated with those forms of renal disease in which high tension is a marked phenomenon.

Claisse and Rendu¹ record a case of uremia of a somnolent type associated with general *cystic disease of the kidney*. In this case as in so

¹ Bull. Soc. Méd. des Hôp., No. 7, March, 1906.

many others of this disease the renal symptoms were so slight that no attention was directed to the kidneys until the terminal uremic symptoms developed. For six weeks before admission into the hospital there had been some slight symptoms of dyspnea which only appeared after exertion and the heart was found to be considerably dilated. Examination of the abdomen failed to reveal any physical signs except slight enlargement of the liver. The urine contained a small quantity of albumin and this associated with the cardiac dilatation led to the diagnosis of nephritis. The point of interest with reference to the case lies in the fact that during the last month of life the patient passed into a somnolent condition and the respiration tended to assume the Cheyne-Stokes type. He presented no other symptom except this somnolence and occasional Cheyne-Stokes breathing. The somnolence gradually became more marked and the patient could only be roused with difficulty to take his food, and gradually the condition passed into coma and death occurred about a month after the onset of the somnolent condition without the development of any other uremic manifestation. At the postmortem examination bilateral cystic disease presenting the typical characters of this malady was found. The renal substance present between the cysts was normal and there were no signs of any interstitial nephritis.

This case is of interest owing to the long continuance of the uremic symptoms, although these were restricted to Cheyne-Stokes breathing and somnolence. This type of uremia, however, cannot be regarded as always associated with cystic disease of the kidneys, although doubtless it is very characteristic of this lesion. There are two other forms of uremia at least that may be associated with cystic kidneys: one which is almost similar to eclampsia in its severity and in the frequency of the epileptiform seizures, and another variety which is the least common of the three where practically no symptoms are present except occasional vomiting and a subnormal temperature and where death frequently occurs suddenly. In other words, the symptoms are strikingly similar to those seen in calculous obstruction, but neither this latent uremia nor the eclamptic variety are seen as frequently as the mere somnolence or gradually increasing stupor in cases of cystic disease.

Cystic disease of the kidney is extraordinarily liable to be overlooked even when the abdomen is examined, as the tumors are not always very readily palpable, and it is therefore important to recognize that the somnolent variety of uremia may be the most characteristic feature of the underlying renal disease.

The Retention of Chlorides in Nephritis. The part played by retention of chlorides in renal disease is looked upon by many as of great importance, and there is an increasing tendency to attribute the occurrence of

renal dropsy to such retention. In many cases of renal dropsy both the onset and the subsidence of the anasarca are seen to be associated with variations in the amount of chlorides in the food and in the urine and it would certainly seem to be proved that the administration of chlorides to some such patients is followed rapidly by the development of dropsy or its increase when present. Further, that a diet consisting of milk, of bread made without salt, meat, potatoes, butter, and soup made without salt, is followed by marked improvement in such cases. Some writers, however, consider that the part played by the retention of chlorides is even greater and that not only the amount of dropsy is so influenced, but that in those forms of renal disease where dropsy is absent and high arterial tension present this arterial tension is largely influenced in its amount by the degree of retention of chlorides.

Bergounignan and Fiessinger¹ record two cases of Bright's disease where observations were made on the amount of chlorides in the food and in the urine. They were both cases of so-called interstitial nephritis and under the treatment of restricting the chlorides considerable improvement was shown in both cases. This was shown by an increase in the body weight associated with an increase in the appetite and the disappearance of the dyspnea and also a great diminution of the polyuria; but the points to which the authors draw most attention are the differences presented in the two cases in the ease with which the chlorides were excreted. In the one case where there was no dropsy there was marked retention of chlorides of a very persistent character and associated with increased arterial tension. In the other case where dropsy was present the retention of chlorides was far less persistent and alterations in the diet were readily followed by either an increase or a diminution in the chloride retention according to the amount of salt administered. Similarly fluctuations in the dropsy corresponding to the degree of retention of chlorides present were readily produced by variations in the diet. The authors point out that the retention of chlorides associated with variations in the amount of dropsy when occurring in nephritis or in heart disease is much better known than the less frequent retention of chlorides seen in some cases of interstitial nephritis and unaccompanied by dropsy in most cases.

The first case was that of a woman aged thirty-eight years, who for the last six months had suffered from dyspnea, especially at night. She presented the ordinary signs of interstitial nephritis with cardiac hypertrophy, a small quantity of albumin in the urine and the pulse tension amounted to 205 mm. of mercury. This high tension and dyspnea persisted notwithstanding treatment with a milk diet, and hence this was

¹ Bull. de Soc. Méd. des Hôp., May, 1906.

altered to the diet mentioned above containing but little chlorides. For a period of twenty days although taking less than 2 grams of salt per day in the food an average of from 4 to 5 grams of chlorides were passed in the urine daily, the extremes varying between 2 and 8 grams. After being on this diet for 52 days the authors state that equilibrium was re-established and from that time the amount of chlorides in the ingesta and in the urine was approximately equal. The excretion of the retained chlorides took place very slowly and the arterial tension fell to 195 mm. The dyspnea entirely disappeared and the patient was able to be up and about although previously the slightest exertion had caused a great increase in the dyspnea.

In the second case where dropsy was present the elimination of chlorides was effected much more rapidly than in the first case. The main point of interest in this case is the fact that not only did the degree of dropsy vary *pari passu* with the degree of retention of chlorides but that the blood pressure also varied. Thus, when as a result of treatment the anasarca began to diminish the arterial tension was at 170 mm. of mercury. A fall to 145 mm. occurred coincidently with the period when the retention of chlorides was *nil*. Subsequently to this the administration of common salt caused a rise in the pressure to 160 and ultimately to 189 mm.

The authors in conclusion draw attention to the notable increase in weight which occurred in these patients associated with increase of appetite and dependent on a true gain in the body weight. Increase in weight in renal disease may be dependent on the development of dropsy, but in such cases the increase in weight occurs at a time when chlorides are being retained. On the other hand an increase in weight associated with the free elimination of chlorides is dependent on a true gain in body weight. In both forms of renal disease the removal of salt from the diet was followed by considerable improvement in the symptoms and especially by the disappearance of dyspnea. Further, the increased excretion of water in the urine may become much less under a chloride free diet.

The authors point out that in interstitial nephritis unaccompanied by dropsy the elimination of the retained chlorides is very slow and the arterial tension remains high to the end. This would seem to bear out the statement made by Potain that in interstitial nephritis unaccompanied by dropsy the arterial tension is but little influenced by diet. On the other hand in the other form of the disease where dropsy is present it would seem that the arterial tension and the degree of development of the dropsy may undergo simultaneous changes. In the present state of our knowledge of the subject it is perhaps not possible to be certain whether the retention of chlorides plays any part in the production of high arterial

tension and of the cardiovascular changes in renal disease, but it would seem that the injection of chlorides in such cases is calculated to increase the high tension.

Renon has quoted the case of a patient suffering from interstitial nephritis with high tension and the usual dyspnea, in whom the symptoms were greatly aggravated by the large quantity of salt this patient was in the habit of eating. The restriction of the diet so that little or no salt was taken was followed by a very marked improvement in all the symptoms and a great diminution in the tension.

Treatment of Nephritis. Tyson,¹ in a communication read before the Section of Medicine of the New York Academy, deals with the treatment of the various forms of nephritis, a subject about which there is still considerable difference of opinion.

In *acute nephritis* Tyson considers that the essential points in treatment are first, rest; secondly, reduction of the diet to the minimum, and thirdly, depletion by brisk purgation or by local bloodletting. The diet should not only be restricted to small quantities of milk but the view is gradually gaining ground that good may result from restricting the patient to water for twenty-four or forty-eight hours.

This is a form of treatment much in vogue with French physicians. Tyson recommends a diet of milk and water or milk and Vichy water. In cases of acute disease there is no harm in restricting the quantity of milk to as little as a pint in the twenty-four hours, at any rate for a few days.

Tyson in common with most writers urges the importance of depletion and advocates the use of saline purgatives for this purpose, and in the event of this not being possible owing to a variety of circumstances he advises calomel. He also considers that local bloodletting by wet cupping over the region of the kidneys may sometimes be useful.

It is probable that in some cases of acute nephritis where complete suppression of urine rapidly supervenes that nephrotomy may occasionally be employed with success. Tyson does not allude to the use of this measure although it was in this type of case that puncture or free incision of the renal capsule was first employed by Reginald Harrison, and there is probably more reason for the employment of this measure in such cases than for decapsulation in the treatment of chronic renal disease. It would certainly seem that in some instances the suppression of the urinary function is brought about as an accompaniment of the excessive distention of the organ, and certainly the urinary secretion may be re-established after free incision of the capsule of the kidney.

Purgation and depletion are not only useful in the treatment of the

¹ New York Medical Journal, February 3, 1906.

nephritis itself but they are also the most valuable measures we possess for combating uremia and dropsy. Tyson is of the opinion that purgation is much more useful than treatment by sweating since there can be little doubt that elimination of the toxic substances that should be excreted in the urine is much more readily effected through the bowel than through the skin.

There is much difference of opinion, however, with reference to the value of sweating and more especially with regard to the use of *pilocarpine*. This drug has been recommended by many in the treatment of uremia and also in the treatment of acute nephritis apart from the presence of uremia. Free sweating can generally be produced by the action of pilocarpine in renal disease, but it is well to remember that this is not always possible because the skin of these patients is frequently abnormally harsh and dry and sweating cannot be produced except by the administration of very large doses of the drug. Tyson considers that pilocarpine may sometimes be used if the case is an urgent one. Other writers, as for instance Carter,¹ look upon pilocarpine with less favor and consider that at any rate it should never be used when uremic symptoms are marked or when coma is present owing to the very considerable bronchial secretion that is produced by its action.

In my opinion pilocarpine is of little value in the treatment of acute nephritis and certainly in full doses its action is by no means free from risk, owing, as Carter points out, to the accumulation of mucous secretion in the bronchial tubes. Other writers, however, look upon pilocarpine as very useful, and Samuel West in a communication on the treatment of renal disease to the Medical Society of London in March, 1906, considers that pilocarpine is valuable for restlessness and sleeplessness and also for threatening uremia in chronic renal disease.

Another question that has led to great variety of statements is the use of *diuretics in acute nephritis*. On *a priori* grounds there is much to be said against the use of diuretics if we regard the kidney lesion as an inflammatory one, and one limited to the kidney. But there are many facts tending to the belief that in many forms of renal disease and even in acute Bright's disease the lesion is not one limited to the kidney but affects the vessels of the body generally. In other words, that dropsy is not necessarily to be regarded as simply the result of the inability of the kidney to excrete water but often the scanty flow of urine is rather the result than the cause of the dropsy. It is clear that if this view of the relation between dropsy and the urinary flow is correct, diuretics might sometimes be of service. Tyson considers that diuretics are unquestionably of use in certain instances, but that their use should

¹ Lancet, February 24, 1906.

follow rather than precede purgatives. He considers that digitalis and the citrate and acetate of potash are the most useful. Digitalis is after all only an indirect diuretic, producing its effects through its action on the circulatory system, and it is possible that in renal disease, especially in its acute forms, digitalis may be of value owing to the tendency to the production of cardiac dilatation.

As already stated there is much difference of opinion with reference to the use of diuretics. Gullen¹ considers that digitalis and stimulant diuretics should never be used in acute renal disease unless complications such as cardiac failure are present, and Carter, on the other hand, has advocated the giving of caffeine hypodermically in cases of total suppression. He recommends dissolving the caffeine in a solution of salicylate of sodium and the administration hypodermically of two or three grains of the caffeine. He states that in cases of suppression this treatment may be followed by the passage first of all of a little bloody urine and then by copious diuresis.

Diuretics may be useful not only for the treatment of suppression but also for the relief of *renal dropsy*, and Rolleston² records a remarkable instance of the value of citrate of caffeine as a diuretic in a case of renal dropsy. In this case a patient continued from March to June suffering from intense renal dropsy which underwent no improvement although he was treated by rest, restriction of fluids and absence of chloride of sodium in the food. There was not only marked anasarca but the abdomen was also enormously distended with fluid and there were signs of double hydrothorax. The heart showed no signs of dilatation. Early in June citrate of caffeine was administered in doses of seven and one-half grains three times a day. The caffeine produced an immediate diuretic effect, the urine increasing from two pints, steadily to five pints and ultimately reached a maximum of seven and one-half pints. In a little over three weeks the anasarca completely disappeared and six months afterward the patient was apparently in excellent health, free from edema, the urine with a specific gravity of 1017 and showing only a haze of albumin. It is clear that diuretics may be of great service in the treatment of acute and of chronic nephritis and that they should not be withheld simply on the ground of theoretical considerations of not stimulating an apparently inflamed organ.

The difficulties in the treatment of *chronic nephritis* are much greater, and Tyson³ points out the value of rest and simple food. The difficulty here is that the beneficial influence of rest is to some extent counterbalanced by the deterioration of health that ensues from prolonged

¹ Lancet, February, 1906.

² Ibid., November 11, 1905.

³ Loc. cit.

confinement and insufficient exercise. Tyson is of the opinion that it is frequently useful to keep patients suffering from the chronic form of the disease in bed for a month or more with the view to the diminution in the amount of the albuminuria and the lack of exercise may be compensated for to some extent by massage.

In one very important class of cases the evidence of the existence of the disease is practically confined to the urine, the patient being more or less unconscious of any marked symptoms of ill-health. In many of these the degree of albuminuria present is high, but there may be no marked cardiovascular changes and no edema or uremic symptoms, and even in some cases the general nutrition may be maintained so that the disease only reveals itself by the albuminuria. These cases really form a group more or less apart, and it is probable that such cases may often be regarded as dependent on a non-progressive lesion of the kidney produced by some former attack of nephritis. Doubtless they are frequently difficult to diagnose accurately inasmuch as some of the gravest forms of Bright's disease may run a latent course for some time and the affection be discovered accidentally by an examination being made for life insurance purposes. Still these cases where albuminuria marked in amount is the only phenomenon can usually be separated from the more serious forms of true chronic Bright's disease by careful examination of the heart vessels and the fundus oculi. The existence of cases of this type show the importance of not treating all cases of albuminuria by any cut-and-dried routine measures based on the mere presence or on the amount of the albumin in the urine. I know of a case where marked albuminuria, the sequel of an attack of nephritis in girlhood, was present for over forty years. It is certainly important to recognise that a high degree of albuminuria may exist as a sequel of some former attack of nephritis and yet be non-progressive and exist for many years without leading to any serious deterioration in general health. Such patients require, as Tyson also points out, to live temperately and quietly and if possible to spend the winter in a warm climate.

The most important point with reference to the diet is that it should be moderate in amount, but there is no particular necessity for great restriction. Thus, for example, no benefit is obtained by putting such patients on a milk diet for prolonged periods, the only result being a general deterioration of health. Nor is there any value in restricting them to so-called white meats as the patient is apt to imagine that he may eat any quantity of white meat and that red meat is highly injurious, whereas, what is really desirable is that the patient should be restricted to a moderate quantity of meat, say once a day, and care should be taken that it is readily digestible. Tyson is of the opinion that eggs are sometimes harmful in chronic nephritis and that they may aggravate the albu-

minuria, but this is the case only in exceptional instances. All writers on the subject are agreed they are not especially contraindicated in chronic nephritis. There is much difference of opinion with reference to alcohol. There can be no question of course that alcohol is a frequent and important cause of chronic nephritis and hence that it is probable that its use tends to aggravate the disease present. On the other hand, alcohol may be necessary in order to enable the patient to take food, but on the whole most authorities are in favor of prohibiting alcohol in renal disease and certainly in granular kidney. Coffee, tea, and tobacco Tyson regards as coming into the same category as alcohol, in other words they may sometimes be harmful but on the other hand they are sometimes useful. The withholding of these substances is to be determined rather by the condition of the heart than by that of the urine. Speaking broadly, cardiac stimulants should be avoided as much as possible and the heart should be strengthened by suitable food and possibly by graduated exercises and massage. Nauheim baths have been much used by some in the treatment of chronic renal disease and Tyson would seem to be of the opinion that this bath treatment is sometimes useful but should not be applied to patients in the most advanced stages of the disease. I have seen great harm result from the bath treatment of chronic nephritis and especially in cases of granular kidney. More than one instance of acute cardiac dilatation rapidly fatal as the sequel of Nauheim baths has fallen under my observation, and in my opinion this method of treatment is not suitable where there are obvious signs of cardiac enlargement associated with marked arterial changes.

As regards general measures it is probable that some benefit may be obtained, especially in cases associated with dropsy, by the restriction of the amount of common salt in the food. It is not difficult to order a diet containing but little common salt and consisting of bread, meat, and vegetables, the bread, however, having to be made specially.

Formerly the free ingestion of water was advised from the point of view of flushing out the kidneys and large quantities were at one time given. This, however, is probably inadvisable as it tends to promote hydremic plethora and thus leads to the production of cardiac dilatation. Tyson thinks that the number of *drugs useful in chronic nephritis* is small: citrate of potash may be of value especially in cases of partial suppression, and potassium, or sodium iodide is also useful in cases of high tension. Digitalis should be used with great care and may be harmful by its action on the already overstrained heart. Tyson considers that opium should not be used if it is possible to avoid it and is under the impression that it may occasionally lead to the development of uremia. He is further of opinion that it is safer to give opium in the parenchymatous nephritis than in the interstitial variety of the affection,

and he regards it as peculiarly dangerous for the treatment of convulsions in cases of contracted kidney. Where chronic nephritis is complicated by dropsy and where uremic symptoms are present, the treatment is to be essentially similar to that of acute nephritis.

Renal Dropsy. Bainbridge¹ in an article on renal dropsy summarizes the present state of knowledge with reference to the pathology of renal edema as it occurs in some forms of acute nephritis and in chronic parenchymatous nephritis. Renal dropsy presents two characteristic features: in the first place the dropsical fluid is not observed primarily in the most dependent parts of the body as a rule, but gravity may influence the distribution of the fluid when the amount of dropsy is large or when it has existed for some time. In the second place, edema fluid is more dilute than that seen in cardiac dropsy as it contains a very much lower percentage of proteid matter, but this diminution in the solid content of the fluid does not apply to the saline constituents. The low percentage of proteid matter may be due to a variety of causes and amongst others to the fact that the percentage of proteid matter in the blood in cases of renal disease is often considerably below the normal, especially in chronic disease. A large amount of salts in the dropsical fluid is a fact of considerable importance in the light of recent knowledge as to the part played by salts in metabolism. Bainbridge points out that three theories have been held with reference to the causation of renal dropsy: it has been imputed to changes in the capillary permeability, to changes in capillary pressure and lastly to changes primarily in the tissues. One of the earliest theories of renal dropsy was that which regarded it as due to changes in the capillary permeability, and it was supposed that these changes together with the state of hydremic plethora induced as a result of the scanty urinary secretion were the real causes of the dropsy; in other words, that the scanty flow of urine was rather the cause than the result of the dropsy. Hydremic plethora produced experimentally failed to lead to the production of any true dropsy but hydremic plethora combined with injury to the vessel walls of the part led to the production of dropsy in the damaged area. The most important observations in this direction were those of Magnus, who poisoned animals by injecting small quantities of arsenic, and then on inducing hydremic plethora, edema of the subcutaneous tissues and of the pleural and other serous cavities was obtained. Similar results were obtained by inducing hydremic plethora after nephrectomy. In the light of these experimental results this view has perhaps received a larger measure of support than any other. One of the great clinical difficulties in the way of accepting this as a complete explanation of renal dropsy lies in the fact that although

¹ Practitioner, December, 1905.

uremia is apparently a toxic condition it may exist unaccompanied with renal dropsy. Further, as Bainbridge points out, increased permeability of the capillary wall renders the lymph which filters through it more concentrated, and thus if renal dropsy were entirely due to this cause it ought to be much richer in proteid than it is. He sums up the position by stating that while it is possible, experimentally, to produce general subcutaneous edema by causing hydremic plethora in an animal whose capillaries have been rendered abnormally permeable, there is but little evidence that these factors play an important part in the production of renal dropsy.

The second view that renal dropsy is due to increased capillary pressure has also been put forward by a number of writers and especially by Dickinson. The arguments adduced in support of this view are first, that the characters of the edema fluid are not those of an inflammatory exudate, and secondly, that mere retention of urine is not an efficient cause of dropsy. Further, high arterial tension is not uncommon in early stages of nephritis associated with dropsy, and it has been stated that in acute cases where edema is absent the arterial tension is low. Dickinson and others have supposed that toxins are present in the blood which increase the resistance to the flow through the capillaries. No such toxins are definitely known and as Bainbridge points out there is no direct evidence of the existence of increased capillary pressure. Further, in inflammation the resistance to the flow of blood through the capillaries is undoubtedly increased, but the permeability of the wall of the vessel is affected at the same time and it is perhaps rather difficult to suppose that the one factor can be affected without the other.

Lastly, some writers have looked upon changes in the tissues as the primary cause of renal dropsy, and Hamberger for instance holds that dropsy is due partly to increased permeability of the capillary wall, and partly to secretion of fluid by the capillary endothelium and that the stimulus to such secretion is provided by certain substances formed in disease. Thus he states that ascitic fluid derived from a patient suffering from nephritis increases the lymph flow from the thoracic duct when injected into dogs and that no such effect is produced by ascitic fluid obtained from patients with normal kidneys.

Lazarus Barlow believes that the essential cause of renal dropsy is the retention of the waste products of metabolism in the tissues and in the tissue spaces. Increased tissue activity increases the formation of lymph, and Bainbridge is of the opinion that when metabolism is taking place in an organ, large molecules are broken down in the tissues into smaller ones which raise the osmotic pressure of the cells and tissue spaces, and in consequence of this, water passes from the bloodvessels into the tissue spaces and so increases the flow of lymph from that organ.

Many observers have shown that in renal disease there is a great excess of nitrogenous extractives in the blood tissues and edema fluids and there is some evidence that in renal disease excessive catabolism of muscles is taking place. On this view a general increase of muscular metabolism would lead to an increased formation of lymph and so soon as the amount of lymph formed was too great to be carried off by the lymphatics it would appear in the subcutaneous tissue as dropsy. Further, the lymph formed by tissue metabolism is more dilute than normal lymph and the dropsical fluid of renal disease is also dilute. Perhaps it may be said that tissue metabolism must be looked upon as an important factor in the production of renal dropsy which has not hitherto been so fully recognized as it deserves.

Bainbridge does not deal at any length with the recent view that renal dropsy is so closely associated with the retention of chloride of sodium, though there can be but little doubt that retention of chloride does occur in nephritis and that it would tend to make the blood and tissues hypertonic, and so with a patient on the verge of edema such retention may be sufficient to turn the scale and lead to the production of dropsy. It is also possible that in nephritis a scanty secretion of urine may depend primarily on an inability of the kidney to excrete its solid constituents rather than upon a deficient filtration of water. Bainbridge sums up the position as follows: That the factors concerned in the production of renal dropsy are: (1) A scanty output of urine; (2) the retention in the body of sodium chloride owing to deficient excretory power on the part of the kidney; (3) increased catabolism in the muscles in consequence of partial or complete loss of control over muscular metabolism by the kidneys. This excessive metabolism brings about the accumulation in the muscles and tissue spaces of waste products, and these by a process of osmosis attract water from the blood into the tissue spaces. Finally, it is probable that as a rule none of these factors is in itself a sufficient cause of dropsy, but that at least two of them are always involved.

FRACTURES, DISLOCATIONS, AMPUTATIONS, AND SURGERY OF THE EXTREMITIES.

By JOSEPH C. BLOODGOOD, M.D.

FRACTURES.

JUDGING from recent literature, the subject of fractures is not given the attention it deserves by American surgeons. In the majority of large clinics in this country the chief surgeons exhibit little enthusiasm in the careful study of fractures. It is quite true that when the fracture is admitted to the surgical clinic weeks or months after the injury, because of a bad result, the surgeon's interest is awakened in its operative treatment.

The more important problems in the treatment of fractures are those which concern themselves with the recent state. It is in this period that the best results are obtained. Proper treatment here not only saves the patient valuable time, but establishes a result with the best function.

Especially in Germany, where the working classes, among which the majority of fractures occur, are all protected by legislative enactments from the loss of earning capacity due to disability from injury, the subject of fractures has been given the attention it merits.

Two factors have influenced the development of a better knowledge of this accident surgery: from a scientific and practical standpoint, the *x*-rays; from a practical and industrial standpoint; accident insurance and legislative protection.

Although a fracture may be considered a strictly surgical disease, the majority of them will and must be treated by the general practitioner who cannot be looked upon as a surgical expert and who may not be prepared to undertake the operative treatment in cases in which it is indicated.

At the present time, and without doubt it always will be so, the general practitioner sees first practically all surgical lesions, and he should be trained to differentiate those in which expert assistance is indicated. This is emphatically true of fractures. The responsibility in the treatment of a fracture, especially in an individual whose earning capacity depends upon the good function of his limbs, is an unusual one.

In presenting the subject of fractures again in *PROGRESSIVE MEDICINE*, I shall endeavor to emphasize the importance of the treatment of the injury in its recent state. In the ideal scheme there should be no fracture left for treatment in any other state. With a careful study and correct treatment the best result is obtained in this state. It is quite true, however, that there will be a certain number of fractures in which, with our present knowledge, perfect results cannot be obtained and there will be some restriction of function.

In considering the treatment of a fracture, attention must first be called to diagnosis. Many of the bad results are due to the fact that the injury has been diagnosed a sprain or a contusion. There are some fractures in which a diagnosis cannot be made without the aid of the *x*-rays. Unfortunately in many localities in this country it is difficult to get a Röntgen picture. This should be remedied as quickly as possible.

The most important factor in the treatment of fractures is the reduction and proper adjustment of the fragments. In some cases this is impossible. This is an indication, with the rarest exceptions, for operative intervention. In some of these cases, even at operation, the fragments cannot be reduced and properly adjusted. In such instances the fragments should be removed. This is especially true of some fractures near joints. By this removal of the fragment in the recent state the patient is saved much discomfort and valuable time.

When a fracture can be reduced without operative intervention it must be decided, after reduction, whether the fragments shall be retained by splints, or whether extension shall be employed. The time and method of massage and passive motion are other very important details.

It is very difficult to discuss these problems clearly in a general way. In the majority of cases each special fracture is a law unto itself.

Treatment of Fractures in General. Carl Beck,¹ of New York, presents an excellent discussion of the modern treatment of fractures. He recommends massage a few days before reduction, and mobilization. In some cases, especially fractures near joints with large effusions, this is a very important procedure. In fissured fractures without displacement, especially of the smaller bones, massage should be employed with the greatest care, or not at all. Beck also considers the operative treatment. J. P. Warbasse,² of New York, whose experience in this accident surgery is very large, contributes a very interesting and valuable article. There are two statements, however,

¹ Medical Record, N. Y., March 24, 1906.

² Journal of Association of Military Surgeons of the U. S., September, 1905.

which I think should be criticised. First, he says, the physician should have a mental picture before him of the condition of the bone which he is treating. He believes that the old methods of diagnosis are still the best and deplors the fact that young practitioners are blunting their diagnostic senses by a too great dependence upon the *x*-rays.

Recent investigation demonstrates that even surgeons of the greatest experience find that their "mental picture" of the condition of the bone without the aid of the *x*-rays is very frequently at fault. It is quite true that in the large majority of fractures the diagnosis can be made, treatment instituted and a good result obtained without the aid of the *x*-rays. Years of experience have demonstrated this. However, modern surgery is not content with the results in even this large group. It is the endeavor of modern surgery, by the aid of newer instruments of precision, to obtain the best possible results in all cases. Properly employed, the *x*-rays will not blunt the diagnostic senses any more than the microscope will blunt the power of making a gross diagnosis of a pathological lesion.

In practically every new investigation on a special fracture the author in the first paragraphs emphasizes the importance of the *x*-rays in diagnosis and treatment. I am quite confident that every physician and surgeon who neglects the aid of the Röntgen picture, when it is possible to obtain it, in his examination and treatment of recent injuries will have much to regret.

Probably in no other large centre in this country are fractures given more attention than in Boston, and the communications from this source are the best in American literature. F. J. Cotton¹ has contributed an extensive article on the treatment of fractures and confirms the views already expressed in this communication.

These three papers—Beck, Warbasse, and Cotton—are the most comprehensive on the general treatment of fractures in recent American literature.

Operative Treatment of Fractures. A certain amount of difference of opinion is found in regard to the indication for operations in their recent state. Among British surgeons Lane² is the most radical in his views. I have discussed his communications in previous numbers of PROGRESSIVE MEDICINE. Lane almost prefers operative intervention in every case. Without a doubt this is unnecessary. Nevertheless, these communications are of great value for the purpose of comparison, and undoubtedly the splendid results of this British surgeon have added to our knowledge of the operative treatment

¹ Boston Med. and Surg. Journal, July 27, 1905.

² Brit. Med. Journ., November 18, 1905.

of fractures in their recent state and increased the positive indication for this method. J. B. Roberts,¹ of Philadelphia, whose experimental and clinical investigation on fractures of the lower end of the radius have become classical, discusses the operative treatment of fractures in a much more conservative spirit. The general subject of the operative treatment of fractures in all stages is discussed by James A. Kelley,² of Philadelphia. In this communication many cases are given in detail with excellent *x*-ray reproductions, chiefly of spiral fractures of the bones of the leg. Kelley in his conclusions expresses the general sentiment of the majority of authorities when he writes: "We should carefully discriminate between the various classes of fracture and select only those for this plan of treatment (operative) which would not be followed by perfect anatomical and functional results if treated by non-operative methods."

The only communication on the subject of fractures presented at the recent meeting of the American Surgical Association in Cleveland was by Martin, of Philadelphia. The most important point emphasized was a proper armamentarium. When a surgeon proposes to expose bones for reduction and suture in their recent state, or resection and suture in the later stages, Martin criticises the usual instruments employed. In the discussion which followed, exceptions were taken to the necessity of complicated and expensive instruments. I believe, however, that time and experience will confirm the statements of Martin. Better results will be obtained with these new and better tools.

Bickham³ writes that among three hundred English surgeons only about 5 per cent. agree with Lane in advocating, without much restriction, the operative treatment of fresh fractures. He agrees with the majority and reserves operative intervention for selected cases.

Foreign Literature on the Treatment of Fractures. I find little to add since the communication of König, which was discussed in detail in *PROGRESSIVE MEDICINE* for December, 1905, p. 206. Martin's⁴ communication, if I can judge from the review (I could not obtain the original), is very extensive. He emphasizes the importance of exact diagnosis with the *x*-rays, and that every fracture must be treated on these indications, restricting operation to those cases in which the *x*-rays show imperfect replacement and in which experience has demonstrated that better results are obtained by operative measures.

¹ New York Med. Journ., November 18, 1905.

² Jour. Amer. Med. Assoc., January 13 and 20, 1906, vol. xlv, pp. 103 and 178.

³ Postgraduate, March 1905, vol. xx, No. 3.

⁴ Centralbl. f. Chir., 1906, vol. xxxiii, p. 192.

The Treatment of Fractures by Extension. Since my reading of Bardenheuer's¹ communication in 1903, which is extensively illustrated, I have read with unusual interest his further communications on his special methods of extension which have recently appeared in book form.² Bardenheuer employs extension, with few exceptions, for every fracture of the upper and lower extremity. He claims that with his method operation in the recent state is never indicated. He also claims such satisfactory results that later operations do not become necessary. The principles of his extension treatment combine traction in a longitudinal direction with countertraction, transverse, oblique, etc. This extension in various directions is obtained by a system of pulleys and weights. The traction in a longitudinal direction is maintained sufficiently to overcome dislocation at longitudo; counterextension, of which there is one or more, according to indications, is so arranged as to overcome dislocations in any other direction.

At first sight the method appears complicated. It necessitates absolute rest in bed for three weeks or more, it requires supervision by a trained physician more than once a day. It is, therefore, not applicable, except in hospitals.

This treatment is employed by Bardenheuer and his school, but at the present time is not accepted by many of his colleagues, who, however, do not dispute his results, but claim that equally as good results can be obtained by simpler methods, and many patients prefer an operation in the recent state with fixation of the fragments to a prolonged confinement to bed. It is very difficult to make a comparative study, but I am quite convinced that in many fractures, both of the upper and lower extremity, results as satisfactory may be obtained by some splint dressing which will allow the patient to be up and about.

I am also able to compare a complicated fracture of the lower end of the humerus which I treated by operation in the recent state with one published by Bardenheuer in which his treatment was employed.

The *x*-rays of the fractures in the recent state are practically identical. In the comparative study of the *x*-rays of the ultimate results I am inclined to the opinion that the anatomical result is better in my case. In both, there is perfect function at the elbow, in both cases there is a slight varus deformity at the elbow. König³ makes the same criticism. I will refer again to this extension treatment in a discus-

¹ Ztschr. f. orthop. Chir., 1903, vol. xii, p. 107

² Published by Ferd. Enke, Stuttgart, 1905.

³ Archiv. f. klin. Chir., 1905, vol. lxxv, p. 1189.

sion of fractures in the neighborhood of the elbow-joint, and give some illustrations.

Bardenheuer and others discuss this extension treatment after operations for genu-valgum, ankle fractures, and fractures of the lower end of the humerus, in the *Festschrift* on the occasion of opening the Akademie f. Braktische Medicin in Cologne.¹ His most recent communication is reviewed in the *Centralblatt f. Chirurgie*, 1906, vol. xxxiii, p. 36.

Bardenheuer does not claim perfect anatomical results, but states that his functional results are always most satisfactory.

I do not believe that Bardenheuer's method of extension will prove popular in this country. At the present time it is even difficult to maintain careful observation of the cases in which extension is employed in American hospitals. The majority of hospitals cannot sacrifice beds for the extension treatment when these patients can be given equally good assurance of a functional result by simpler means. I must confess that I prefer operation in the recent state in selected cases to this prolonged bed treatment with extension.

From my reading of the literature I do not think that Bardenheuer has proved that his results are better, and for this reason surgeons are not doing any of their patients an injustice by not employing the extension treatment. However, in those cases in which extension is the accepted method of treatment one should turn to Bardenheuer for the details and should bear in mind that in many cases traction in a longitudinal direction is not sufficient.

Heusner² is an advocate of the extension treatment for many fractures and in his communication gives a few illustrations of his method of maintaining extension in fractures of the upper extremity which allow the patient to be up and about.

Ambulatory Treatment of Fractures. Some years ago, when this method was introduced in Germany, it rapidly became popular and was employed in a large number of cases. It was soon found, however, that the method was not suitable for all fractures, and at the present time this treatment has found its proper restrictions. The only special discussion in the literature is by Hennequin and Berger,³ who reject this form of treatment except in certain cases, which apparently is the view of French surgeons at this time.

Pseudarthrosis in Fractures. Cornil and Coudray⁴ have made some very interesting experiments with rabbits and dogs, in which, after

¹ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 18.

² *Deutsch. Ztschr. f. Chir.*, 1906, vol. lxxx, p. 401.

³ *Bull. et Mém. de la Soc. de Chir. de Paris*, vol. xxix, pp. 1047 and 1153.

⁴ *Revue de Chir.*, 1904, vol. xxx, p. 1; review in *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 13.

producing a fracture of the ribs or long pipe bones, the injured part was not dressed and was subjected daily to passive motion and massage. Their experiments demonstrated that these manipulations retarded slightly callus formation, but that in the end more callus was formed. Bony union always took place if the fractured ends remained in continuity. Motion and massage, therefore, are beneficial to bone union. Non-union is due to the dislocation of the fragments or the interposition of soft parts. These experiments are confirmed by clinical observation.

This recent experimental work reminds me of the investigation of Nicholas Senn made many years ago on fractures of the neck of the femur. Senn was surprised to find that his best result was observed in a dog who received no treatment at all after the neck of the femur had been divided through an open incision. Older authorities have called attention to the fact that slight motion at the site of fracture is beneficial to healing providing the fragments are not dislocated. I have just observed a fracture in the upper portion of the foreleg of a cat which has healed perfectly without any treatment.

Healing of Fractures. After the solution of continuity of bone and periosteum the space between the torn tissues is filled with blood; the connective-tissue cells and capillaries of the periosteum and spaces in the bone tissue immediately react and the space first filled with blood is in time completely replaced by granulation tissue; specific bone-forming cells of the periosteum and endosteum then become active in the calcification and ossification of this granulation tissue. This cell activity constitutes bony union. The irritation of the blood effusion excites cell proliferation between the periosteum and the bone and in the medullary cavity for some distance above and below the line of fracture.

Bier¹ has demonstrated, from clinical observation and experiments on delayed bony union and pseudarthroses, that the blood effusion is a factor of importance in aiding the production of new bone. For this reason, when in a compound fracture, or in operations for recent simple fractures, the fragments are exposed, one should not remove the blood-clot, and should, if possible, encourage the bathing of the fractured ends in blood. In instances of delayed union or pseudarthrosis, Bier is of the opinion that he has facilitated ultimate bony union by the injection of fresh blood into the space between the bones; this blood has been obtained by aspirating an obstructed vein in the arm of the patient, or from animals or other individuals. There is every evidence that Bier is correct. The observations of Schede

¹ Medizinische Klinik, 1905, No.1 and 2; reviewed in *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 87.

and Halsted on the organization of blood clot after operations for osteomyelitis may be considered confirmatory of Bier's view.

For practical purposes a knowledge of the healing of the tissue in fractures is most important. The first requisite for osseous union is apposition; interposition of soft parts, or overriding of the ends of bone are the two chief factors in the production of a pseudarthrosis. If the overlapping fragments are covered with periosteum there will be absolutely no bone formation of any value. Slight motion at the sight of fracture is beneficial rather than harmful.

Now and then, though the anatomical position of the fragments be best for bony union, callus formation is retarded. In such cases one must look for the etiological factor, not in the local condition, but in the general condition of the patient. Most authorities are of the opinion that syphilis retards the production of osteoid tissue. The treatment of the general condition is followed by bony union. Other cases are more difficult to explain. The patients are generally anemic and show every evidence of bad nutrition. Fortunately, although at this time we are not certain of the etiological factors which retard the formation of callus, we have general and local means of stimulating bone production at the site of fracture.

The experimental work and clinical observations on *thyroid extract* have proved its value as a stimulant to new bone formation. This should be given to patients in whom bony union is delayed. These patients should also be subjected to the ambulatory treatment in a fixation dressing which will prevent dislocation of the fragments and allow frequent massage. In such cases, if the *x*-rays show apposition of the bone fragments, and no clear space which could be interpreted as the interposition of soft parts, operation is contraindicated, at least one which plans resection and suture. In a case, which I have mentioned before in *PROGRESSIVE MEDICINE*, there was no evidence of union two months after a transverse fracture of the tibia and fibula in which the bones were in absolute apposition. An operation was undertaken at this time. The bones were glued together with a soft vascular tissue in which one could feel some new bone; resection and suture were performed; three months later the union after this operation was no firmer than two months after the recent injury; this patient was allowed to walk with the leg in plaster; it was fully a year before the support was discontinued; in this case no other treatment was employed, except antisiphilitic measures. At the present time I would give such a patient thyroid extract and employ Bier's method of blood injection. In the older methods of treating pseudarthroses, surgeons, with a drill, made one or more perforations through the soft callus and through the bone on each

side and apparently obtained results. These results, I think could be explained on the supposition of blood effusion. I have recently seen Dr. Park, of Buffalo, drill in a case of delayed union of a fracture of both legs, and he informed me that his experience justified this procedure. Although delayed union and pseudarthrosis are not frequent, yet when they do occur, I am inclined to the view that the condition is allowed to grow worse on account of the inactivity of the surgeon.

In all cases of fracture one must be certain of the position of the fragments from the *x*-rays. Bony union should be tested for from time to time; the first evidence of its absence or delay should be an indication for more active general and local treatment; the patient should be gotten out of bed, a dressing should be applied which interferes least with the circulation of the limb; massage should be more actively employed; thyroid extract should be given (about five grains once a day is sufficient); antisyphilitic treatment should be instituted if indicated; proper means employed for general nutrition, especially should the patient be kept in the fresh air. If these means do not produce quickly the desired result, local measures should be instituted: Bier's injection of fresh blood, or the drilling of the bone at the site of fracture. My experience, however, teaches me that if energetic treatment is begun early the latter local measures which appear somewhat formidable in a patient with fracture, will seldom be required.

Space forbids the proper presentation of Gelinsky's¹ monograph, which considers the operative treatment of badly and ununited fractures, and is well illustrated with *x*-ray studies. The chief point in the communication is an osteoplastic flap originating with the chief of the clinic, Müller, which is applicable especially to the tibia. A tongue-shaped flap is made over the upper fragment of the tibia, the tip extending 1 cm. to 2 cm. beyond; this flap consists of soft parts, periosteum and a thin plane of bone removed with the chisel. In other respects the management of the badly or ununited fracture is the same. After the fracture is sutured, this bone-flap rests over the sutured bone, and according to Müller, gives greater assurance of osseous union.

Dislocations of Fragments. The most scientific article of this year which concerns itself with fractures is contributed by Zuppinger,² whose observations on spiral fractures have been discussed in previous numbers of *PROGRESSIVE MEDICINE*. To be appreciated this article must be read in the original. He not only describes accurately all the possible dislocations, but gives mathematical formulæ by which

¹ *Beit. z. klin. Chir.*, 1906, vol. *xlvi*, p. 42.

Ibid., vol. *xlix*, p. 26.

they can be accurately measured in the *x*-rays. The more gross dislocations which prevent or retard bony union I have discussed. They are not difficult to recognize, nor to correct. Zuppinger, however, calls attention to slighter forms of dislocation of the fragments, which as a rule do not interfere with bony union, but which, when bony union is accomplished, restrict function. This is a subject of the greatest importance. In the majority of cases it is not much of an art to accomplish the solid healing of a fracture. In many cases, however, it is most difficult and should be considered the greatest achievement of the art of treating a fracture, not only to accomplish a healing of the bone, but to attain this end without any dislocation of the fragments which would interfere with future function.

Examples of healing with bad function are too numerous to mention. The degree of impairment of function and the loss of earning capacity of the patient vary not only with the fracture and the degree of impairment, but with his occupation. Traumatic coxa vara is a good example how a slight dislocation between the head and the neck of the femur may result in seriously crippling the patient. Many cases of flat-foot, knock-knee, and chronic arthritis deformans are due to a dislocation at the site of a fracture, which so changes the plane of burdening that the joint is subjected to constant trauma and the aforesaid deformities are produced. Restriction of motion in the elbow after fracture in its neighborhood is a common occurrence. Extreme loss of function of the finer manipulations of the hand after a Colles' fracture is often pathetic. I have recently observed two cases of old Colles' fractures in musicians who are unable, on account of the slight dislocation, to continue to perform on the piano.

These slighter dislocations can only be estimated by the most careful *x*-ray studies in various positions. Their perfect reduction and maintenance in the proper position is difficult, and in some cases our present methods are inadequate. I will discuss these under special fractures. I call attention to this communication of Zuppinger, with the object of making an emphatic impression that in the treatment of fractures we must keep clearly in mind future function, and use every means to discover and reduce any dislocation which would interfere with perfect function.

Zuppinger makes one statement which is so general in its character that it applies to almost every fracture. He says that a fracture with dislocation and longitudinem (overlapping) should be reduced within the first three days, because after this reduction becomes more and more difficult, and, after the second week, is practically impossible to accomplish. I agree with Zuppinger that this is the dislocation in fracture which should be immediately overcome.

Special Fractures and Dislocations. UPPER END OF HUMERUS. In PROGRESSIVE MEDICINE, December, 1903, the literature on this subject was considered at some detail up to that time, and in the issue of December, 1902, I had called special attention to the rare isolated fracture of the small tubercle (*tuberculum minor humeri*). Since 1903 the literature on fracture in the upper portion of the humerus is unusually meagre. Nieszytka¹ gives a very interesting and complete *resume* on the isolated fractures of the large tubercle of the humerus (*tuberculum major humeri*). He calls attention to the fact that the diagnosis of contusion is frequently made. The fracture can only be recognized when an *x-ray* is taken of the shoulder in extreme outward rotation. This fracture may be complete or incomplete. When complete, the fragment dislocates upward, or posterior, or both and may become fixed to the glenoid cavity or the end of the acromial process.

Every case of contusion of the shoulder should be subjected to an *x-ray* examination, and more than one view taken. One must bear in mind these isolated fractures of the major and minor tubercle. When the fracture is not complete and recognized in the recent state good results are obtained by fixation in a simple dressing and early passive motion and massage. When the fracture is complete and associated with dislocation of the fragment the best results are obtained by immediate operation. If the fragment cannot be easily replaced and fixed it should be removed by subperiosteal enucleation.

Broca² considers fractures of the upper portion of the humerus in a clinical lecture. He disagrees with Lucas-Championniere's method, which consists of massage only, and advocates in the early days extension to be followed later by fixation in plaster.

In fractures of the anatomical neck or epiphyseal separation the small fragment is frequently not dislocated, and excellent anatomical and functional results are obtained by extension. I disagree with Broca and believe that this fracture should never be fixed in plaster, but treated with extension and massage during the first two weeks, to be followed by slight fixation dressing which can be changed every few days for passive motion and massage. If the fragment is dislocated and cannot be reduced, operation in the recent state is always indicated. If at this open incision the fragment cannot be replaced and easily fixed in position, it should be removed.

The same statements apply to fractures of the surgical neck, except, it will never be necessary to remove the fragment, and, with the rarest

¹ Deutsch. Ztschr. f. Chir., 1906, vol. lxxxii, p. 147.

² Centralbl. f. Chir., 1905, vol. xxxii, p. 1244

exceptions, the dislocation can be reduced without operation. Extension is the best method of treatment.

I wish to call attention here to cases frequently diagnosed contusion of the shoulder, traumatic arthritis, or neuritis. In many of these cases the diagnosis is incorrect—there may be a fracture of the major or minor tubercle, partial or complete, or one of the anatomical head, or a partial or complete tear of the cartilage of the head of the glenoid cavity, or there may be no fracture at all, but a subdeltoid bursitis which has recently been described by Codman. I will discuss this again under arthritis.

If these fractures are not recognized and the fragments are slightly dislocated they lead to a change of the relation between the head of the humerus and the glenoid cavity, which is always associated with more or less impaired function. This anatomical defect, with or without the formation of a loose joint body, quite frequently produces a chronic synovitis and is associated with excessive exudate distending the joint capsule. In this stage the so-called habitual dislocation of the shoulder-joint is observed. In the further course of the arthritis the entire joint may be so disorganized that ankylosis takes place.

If a diagnosis is correctly made in the recent state, good function is obtained by proper treatment, and bad anatomical and functional results should not follow.

CONGENITAL ELEVATION OF SHOULDER. This rare congenital deformity is fully described with illustrative cases and complete literature by Oscar Ehrhardt.¹ It may be due to an intrauterine burdening deformity. In this variety operation is contraindicated, and only fair results are obtained by long and tedious treatment. When the deformity is due to a muscle defect, in some cases improvement follows tenotomy. The best results are obtained in that form of the deformity in which the scapula is fixed by osseous and ligamentous attachments to the vertebræ. In some of these cases, however, the operation may become very extensive. In one case the spinal column was opened and the dura injured. Ehrhardt gives the following references to American authorities: Gibney, Goldthwait and Painter,² Wilson, and Forrance.³

CONGENITAL AND ACQUIRED DISLOCATIONS OF THE SHOULDER-JOINT. This subject is considered by Whitman.⁴ There are three groups: the true congenital; the acquired, which takes place through violence at birth, and one due to injury of the brachial plexus. The two latter

¹ *Beit. zur. klin. Chir.*, 1904, vol. xlv, p. 470.

² *Trans. Amer. Orthop. Assoc.*, 1901, vol. xiv.

³ *Annals of Surgery*, 1900.

⁴ *Ibid.*, July, 1905, vol. xlii, p. 110.

forms may be associated. The third, or so-called obstetrical paralysis, is the most frequent and important variety. Dislocation is secondary, and, according to Whitman, if the arm of the injured baby is at once supported the dislocation will not take place. For any variety of these dislocations, reduction under anesthesia is the mode of treatment—the sooner the better.

EXCISION OF HEAD OF THE HUMERUS. The functional results after excision of the head of the humerus for tuberculosis, osteomyelitis, or ankylosis due to any cause, are so good that one should not hesitate to perform the operation for permanent restriction of function in this joint. However, proper diagnosis and treatment in the early stages of the various lesions will make this operation unnecessary.

FRACTURES OF THE SHAFT OF THE HUMERUS. Diagnosis as a rule is not difficult without the *x*-rays, treatment is as a rule simple and yields excellent anatomical and functional results. The *x*-ray studies, however, will allow us to recognize the oblique and spiral fractures which are more difficult to treat and in which now and then operation is indicated. These I have previously discussed.¹ The case of spiral fracture which I reported at that time and which was treated by open incision has at the present day an absolutely perfect anatomical and functional result. In this case I used the Middeldorpf's splint.²

Senn³ reports an interesting case of fracture of the shaft of the humerus with posterior dislocation of the head of the humerus. The dislocation was not recognized until the second week. It was reduced after two attempts. The first *x*-ray picture after the accident, taken anteroposteriorly, did not show the dislocation; it was only later, after the swelling had disappeared, that it became evident clinically and was made out in a lateral *x*-rays.

FRACTURES OF THE LOWER END OF THE HUMERUS. The problems in the treatment of these complicated fractures are by no means settled. I introduced a discussion of the literature of this subject in 1900. At that time Wolff's monograph was considered in detail with a reproduction of an excellent *x*-ray photograph. Wolff's communication was concerned chiefly with the epiphyseal separation in children. The subject was again considered in December, 1902, with a full classification of all possible fractures and the various methods of treatment, especially treatment with the forearm in acute flexion. I had very little to add to this subject in 1903.

Lorenz's⁴ communication should be compared with Wolff's, which

¹ PROGRESSIVE MEDICINE, December 1903, p. 103.

² Ibid. ³ Annals of Surgery, August, 1905, vol. xlii, p. 314.

⁴ Deutsch. Ztschr. f. Chir., 1905, vol. lxxviii p. 531.

I have discussed, except that he considers but one variety—the isolated fracture of the capitellum. In the opening pages of Stolle's¹ extensive communication he discusses the time of ossification of the various epiphyses of the lower end of the humerus and finds considerable difference of opinion between various authorities. For practical purposes the statements made by Wolff² may be accepted as correct.

There is no doubt, however, that the age of complete ossification, or the appearance of the first bone nucleus, varies. In these young individuals one should always make an *x*-ray of both elbows. The first epiphysis to ossify is the capitellum, fractures of which are considered by Lorenz, and of which there are two varieties. One, the so-called peeling fracture, in which a piece of cartilage, with or without bone, is partially or completely separated (*fractura rotulæ partialis*) (another name of the capitellum is *rotula*); it is that part of the articular surface of the humerus which comes in contact with the head of the radius). The second is a complete fracture (*fractura rotulæ totalis*). Lorenz studies only the partial fractures. The complete fractures have been reported by Steinthal, Hahn and others. In the complete fracture there is much more primary swelling of the elbow with hemorrhage into the joint; as a rule the loose fragment can be felt. The only treatment is removal of the completely separated capitellum.

The incomplete, or peeling, fracture is one of the rare lesions of the elbow-joint after ossification. It was first described by Kocher in 1896, who reported four cases. Lorenz describes his two cases, in which the clinical picture is identical with that of Kocher. As a rule the force is indirect, and the head of the radius is impacted against the capitellum. In one or two cases there was a direct injury to the elbow-joint. The fragment always dislocates backward; there is very little primary swelling of the elbow-joint, the diagnosis is not difficult if the possibility of the injury is borne in mind. The patient complains of local pain referred to the outer side of the lower end of the humerus, and there is some restriction of motion; on palpation one finds definite tenderness in the position of the capitellum, and now and then the fragment. An *x*-ray is not necessary to make a positive diagnosis. The anatomical points of the elbow, the internal and external epicondyles and acromion are not changed; the chief restriction of motion is in full extension; now and then the fracture may be complicated with one of the head of the radius. The best treatment is removal of the small fragment; it is not necessary to reproduce his illustrations.

Stolle³ discusses the treatment and ultimate results of 140 cases of

¹ Deutsch. Zeitsch. f. Chir., 1905, vol. lxxiv, p. 65.

² PROGRESSIVE MEDICINE, December, 1900, p. 135.

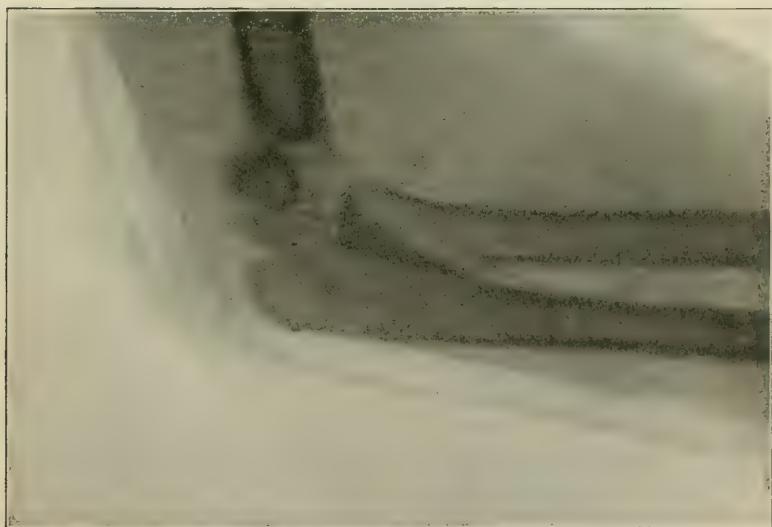
³ Loc. cit.

injuries in the region of the elbow-joint treated in Bardenheuer's clinic by the latter's special method of extension. This article may be considered a representative one of Bardenheuer's methods and results, and can be used in a comparative study with cases from other clinics in which simpler apparatus is employed or in which the fragments have been treated by open incision.

The classification follows the lines which I have previously discussed.¹

From the illustrations, I must confess that the treatment seems complicated—the chief criticism of his colleagues—notwithstanding the fact that Bardenheuer claims that it is simple. Stolle is able to give the ultimate results in only 38 cases of 140. Compared with the

FIG. 8



Eighteen hours after injury.

literature and my own experience, I am unable to see that their anatomical or functional results are any better than in a similar group of cases treated by simpler apparatus or open incision, provided that the same care and supervision be given to the details of the treatment which characterize Bardenheuer's method.

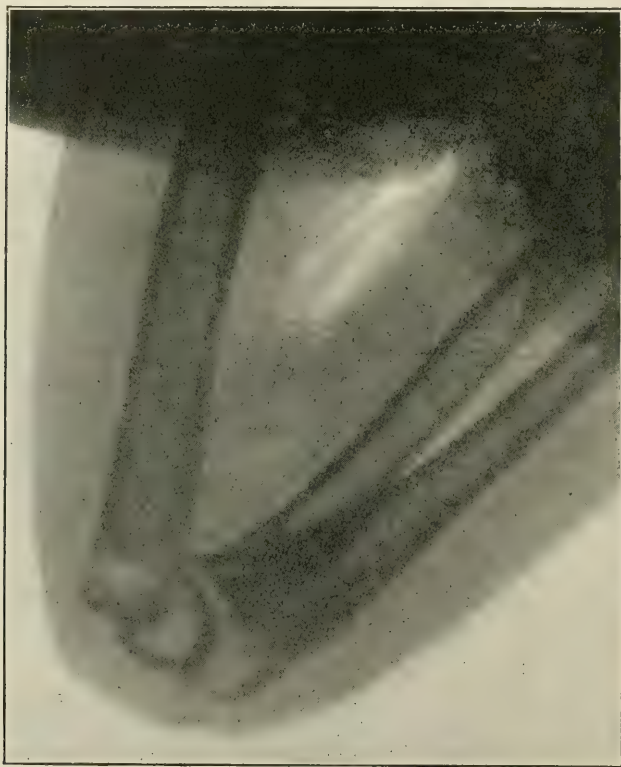
Ashhurst² reports an observation of *supracondyloid fracture of the humerus* in a girl of nine, in which there was practically a perfect result after treatment in acute flexion (Jones' position). Fig. 8 is an x-ray eighteen hours after injury. The lower fragment is dislocated

¹ PROGRESSIVE MEDICINE, December, 1902, p. 107.

² Amer. Jour. Med. Sci., June, 1905, vol. cxxix, p. 992.

posteriorly. Fig. 9 is an *x*-ray on the fourth day, and shows the complete anatomical reduction of the fragment, at least anteroposteriorly; the possibility of a lateral dislocation could not be excluded from this *x*-ray. In the further treatment of the case the bandage was changed every third day for passive motion and massage. In the third week the forearm was placed at a right angle, at the end of the fourth week simply a sling, by the sixth week there was no impairment of motion. Ashhurst mentions the fact that this position in

FIG. 9



Fourth day of treatment

the treatment of fractures in adults is not always possible, and, on account of the action of the triceps, the fragment may be retained in its displaced position. When this treatment is employed it should always be controlled by *x*-ray pictures.

In *PROGRESSIVE MEDICINE* for December 1902, p. 110, I called attention to the fact that the consensus of opinion favored the right-angle position of the forearm in supracondylar fractures and in separation of the lower epiphysis of the humerus. In this observation of

Ashhurst, however, one cannot dispute that the acute-angle position has accomplished a perfect result.

FRACTURES OF THE HEAD OF THE RADIUS. T. Turner Thomas,¹ contributes a most thorough experimental and clinical study of this fracture, with a detailed report of the cases in the literature. He calls attention to the fact that in some cases the fragments are in such close apposition that the line of fracture may not show in the *x*-rays. In such cases the ligament is not torn. When the fracture is displaced it is easily seen in the *x*-rays. Crepitus is usually present, and this will be a factor in diagnosis when the fragment is in place. In uncomplicated fracture good results should be obtained. In the complicated cases, according to most authorities, the ultimate results are not satisfactory. Thomas is of the opinion that operation and excision of the fragment should only be employed when it is detached and displaced. Sprengel² advocates an open incision and reduction of the dislocated fragment, and advises drainage after operation. I must confess that I agree with Sprengel, that this should be done if the *x*-rays show a displacement which cannot be reduced. I have seen but two cases. In one I was able to reduce the fragment without anaesthesia, the injury was treated with the forearm in acute flexion, and there is a perfect anatomical and functional result. In the second case, which I saw with Dr. Sowers, there was no displacement. The line of fracture, however, showed in the *x*-rays and crepitus was obtained.

FRACTURE OF THE CORONOID PROCESS OF THE ULNA. There is no recent literature on this fracture. The case which I reported³ has at the present time a perfect result. I saw this patient five months after the accident; there was considerable restriction of motion due to the dislocation of the fragment and callus formation; through an open incision this bony obstruction was chiselled away; complete motion was not restored in the elbow-joint for six months, although the patient was unusually energetic in massage and forced motion. In a second case observed some years ago in the recent state, a perfect anatomical and functional result was obtained by treatment in acute flexion associated with energetic passive motion and massage after the seventeenth day. The case of oblique internal fracture of the lower end of the humerus, in a girl of five, in which the dislocated fragment could not be reduced after various methods and trials, and in which it was reduced and sutured by open incision, has at the present time a perfect functional result, three years after operation.⁴

¹ Univ. of Penna. Med. Bull., September-October, 1905, vol. xviii, pp. 184 and 221.]

² Centralbl. f. Chir., 1905, vol. xxxii, p. 114

³ PROGRESSIVE MEDICINE, December, 1902, page 112.

⁴ Reported with *x*-ray pictures in PROGRESSIVE MEDICINE, December, 1903, p. 130.

COLLES' FRACTURE OF THE RADIUS. Since my last discussion of this subject¹ the only interesting communications are those concerning this fracture sustained in an injury from turning the crank in automobiles. The subject is fully considered in communications by Lucas-Championnière² and Ghillini.³ The fracture is of interest chiefly on account of its etiology. As a rule, according to Lucas-Championnière, there is little or no dislocation, and very simple treatment is all that is necessary.

Its frequent occurrence should caution chauffeurs in the proper handling of the crank. In the more modern machines, at least in this country, the accident is apparently rare.

Wolkowitsch⁴ contributes an extensive communication on the mechanism and treatment of Colles' fracture. One familiar with this surgeon's partiality for plaster-of-Paris⁵ will not be surprised to find that he uses this method in treating Colles' fracture. The plaster dressing is so made that it can be removed without difficulty for passive motion and massage. I mention this communication chiefly to record again my objection to the use of plaster in Colles' fracture. The proper treatment of this injury has been carefully considered,⁶ and I find nothing in recent literature or in my own experience to change the views then expressed, except Zuppinger⁷ in his study of dislocations of the fragments suggests that in fractures of the lower end of the radius, after reduction, he does not believe that the usual position of volar flexion and ulnar abduction accomplishes what is expected upon the distal fragment. His *x-ray* studies demonstrate that ulnar abduction is unnecessary and even harmful, that the hand should be straight in dorsal flexion, and the fingers should be flexed. I have used this position in a few recent cases, but am not prepared to accept it as final.

FRACTURES OF THE CARPAL BONES. On this subject during the last two years there have appeared more interesting publications than on any other single fracture. The most important and extensive monograph has been written by Codman and Chase,⁸ of Boston. In view of the accessibility of this American journal and the difficulty of doing this communication justice in a short space, the reader is referred to the original. The more important conclusions are as follows:

¹ *PROGRESSIVE MEDICINE*, December, 1903, p. 130.

² *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 1108.

³ *Zeitschrift f. orthop. Chir.*, 1905, vol. xiii, p. 759; and *Archiv. f. klin. Chir.*, 1905, vol. lxxvii, p. 268.

⁴ *Archiv f. klin. Chir.*, 1905, vol. lxxvi, p. 917.

⁵ *PROGRESSIVE MEDICINE*, December, 1903, p. 125.

⁶ *Ibid.*, p. 130.

⁷ *Loc. cit.*

⁸ *Annals of Surgery*, March and June, 1905, vol. xli, pp. 321 and 863.

1. "Sprains" of the wrist which do not promptly recover are in many cases fractures or dislocations of the carpal bones.

2. The large majority of such carpal injuries are either simple fractures of the scaphoid or anterior dislocations of the semilunar bone.

3. These two injuries are frequently combined, and in such cases the proximal fragment of the scaphoid is usually dislocated forward with the semilunar.

4. Simple fracture of the scaphoid gives a definite clinical picture and may be recognized even without the *x*-rays by the association of the following symptoms, viz.: (a) The history of a fall on the extended hand; (b) localized swelling of the radial half of the wrist-joint; (c) acute tenderness in the anatomical snuff-box when the hand is adducted; (d) limitation of extension by muscular spasm, the overcoming of which by force causes unbearable pain.

5. A broken scaphoid has little power of repair and appears capable of but slight callus formation.

6. Fractures of the scaphoid which remain untreated, or are treated by massage and active and passive motion, generally, if not always, remain ununited, and the original symptoms often persist for years with only slightly abated intensity.

7. Cases of fracture of the scaphoid may unite if motion of the wrist is prevented during the first four weeks after the injury, but if by this time no union has occurred, future union is unlikely.

8. Excision of the proximal half of a fractured scaphoid gives a somewhat better result than conservative treatment.

9. A posterior incision to the outer side of the tendons of the extensor communis digitorum gives an easy and safe access to the proximal half of the scaphoid.

10. Passive motion of the wrist-joint and active motion of the fingers should be begun within a week after this operation.

11. The possibility of the existence of a bipartite scaphoid should be considered in interpreting *x*-rays of simple fracture of the scaphoid, but its occurrence must be very rare in comparison with fracture.

12. Anterior dislocation of the semilunar bone should be recognized clinically, even without the *x*-rays, by the association of the following symptoms, viz.: (a) The history of an injury of considerable violence to the extended or twisted wrist; (b) a silver-fork deformity, the posterior prominence of which corresponds with the head of the os magnum, and between which and the lower end of the radius is found a groove representing the position formerly occupied by the now anteriorly dislocated semilunar; (c) a tumor under the flexor tendons of the wrist just anterior to the lower end of the radius; (d) a shortened

appearance of the palm as compared to the other hand; (e) stiffness of the partially flexed fingers, motion of which, either active or passive, is painful; (f) the persistence of the normal relation of the styloid processes of the ulna and radius and the existence of shortening of the distance from the radial styloid to the base of the first metacarpal.

13. Recent dislocations of the semilunar may be reduced with good results even after the fifth week by hyperextension followed by hyperflexion over the thumbs of an assistant held firmly in the flexure of the wrist on the semilunar.

14. Irreducible dislocations demand excision of the semilunar and the whole or a portion of the scaphoid if there is a coincident fracture of the latter.

I had the opportunity, at the meeting of the Clinical Society of Surgery in Boston, to examine some of Dr. Codman's splendid results.

Ely,¹ of New York, reports a case which was observed four weeks after the injury; it had not been recognized in the recent state: the patient had been treated in a New York hospital for contusion of the wrist. The *x*-rays in the fourth week showed a displacement of fragments and no result was obtained by forced motion under ether. Ely remarks that this observation demonstrates the necessity of early recognition and reduction of the deformity, points also emphasized by Codman and Chase. The communications by Wolff² on this fracture agree in their conclusions with those of Codman and Chase.

FRACTURES OF THE METACARPAL BONES. Lyman,³ of Denver, reports a case of backward dislocation of the second carpometacarpal articulation, and calls attention to its rarity. It was recognized easily clinically. As attempts at reduction failed, it was necessary to make an incision; the head of the metacarpal overlapped the trapezoid bone; it was reduced by inserting a chisel under the metacarpal bone and prying it into place.

Schlatter⁴ has contributed a monograph on fractures of the metacarpal bones with many illustrations and a consideration of the literature. He reports twenty-three cases and advises Beck's⁵ method of rubber-tube splints, which I will call attention to again in the discussion of Russ' communication. (See Fig. 10.)

Beck⁶ calls attention to a fissure fracture of the metacarpal bone which he thinks has not yet been described. It was recognized in the *x*-rays. In this communication he mentions his rubber-tube splint.

¹ *Annals of Surgery*, August, 1905, vol. xlii, p. 260.

² *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 523; original in *Archiv. f. klin. Chir.*, 1905, vol. lxxvii, p. 634.

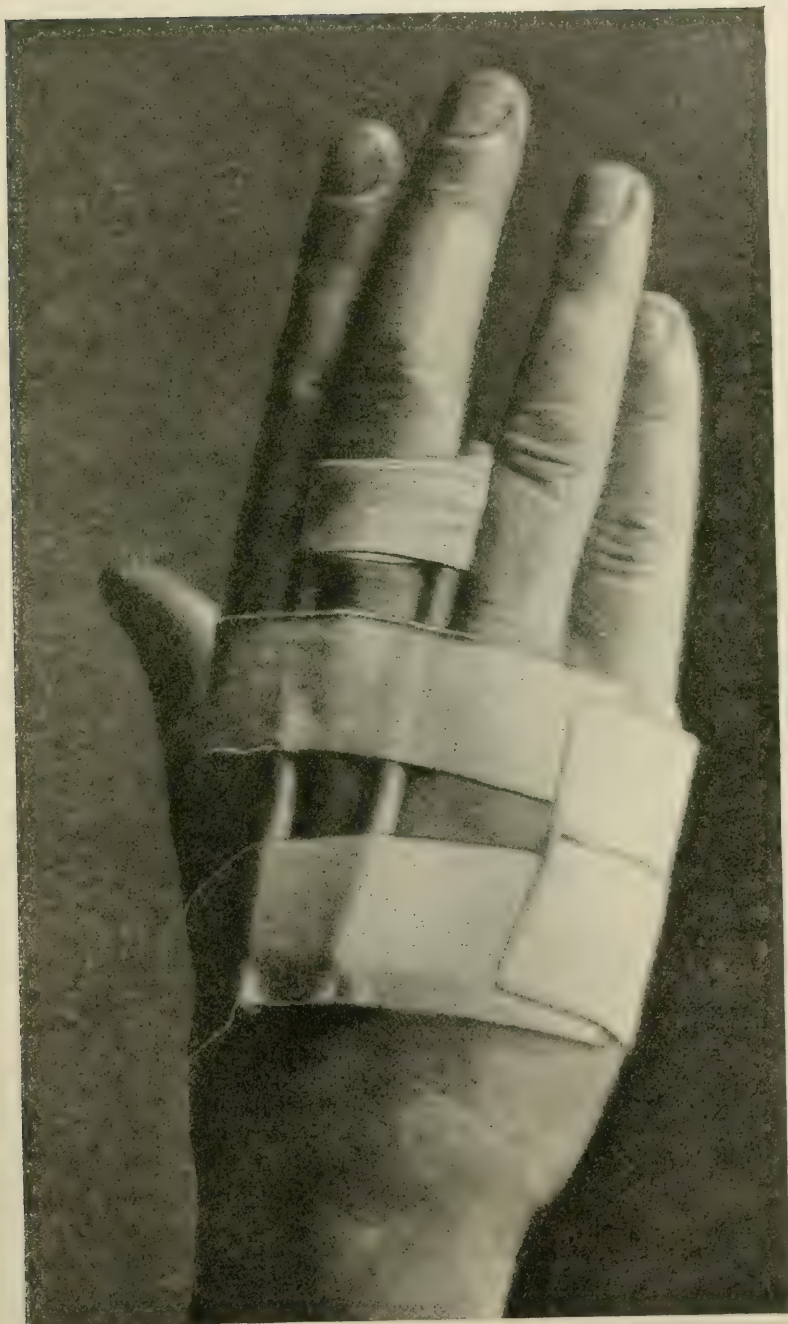
³ *Annals of Surgery*, June, 1906, vol. xliii, p. 905.

⁴ *Beit. zur klin. Chir.*, 1906, vol. xlix, p. 280.

⁵ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 1245.

⁶ *Loc. cit.*

FIG. 10



Rubber-tube splint for metacarpal fractures.

Russ,¹ of San Francisco, publishes some interesting cases of metacarpal fractures. Fig. 10 illustrates the method of treatment with rubber tubing and adhesive strips recommended by Beck. In the second article he describes Bennett's fracture of the metacarpal of the thumb. Good results are obtained by simple fixation dressing with small splints and adhesive straps.

FRACTURES OF THE PHALANGES. Schulz's² communication may be considered the most recent monograph. It is fully illustrated.

FRACTURES AND DISLOCATIONS OF THE METATARSAL BONES. Fischer³ considers the literature and reports two cases of isolated

FIG. 11



dislocation of the first metatarsal bone. It is comparatively an infrequent injury; the head of the bone is usually posterior. If it is not reduced in the recent state, it may be necessary to resect the head of the metatarsal. Even after this operation the functional results are good.

Lilienfeld⁴ makes a very important contribution on fractures of

¹ *Annals of Surgery*, February, 1906, vol. xliii, p. 288; and *Jour. Amer. Med. Assoc.*, June 16, 1906, vol. xlv, p. 1825.

² *Deutsch. Ztschr. f. Chir.*, 1905, vol. lxxvi, p. 232.

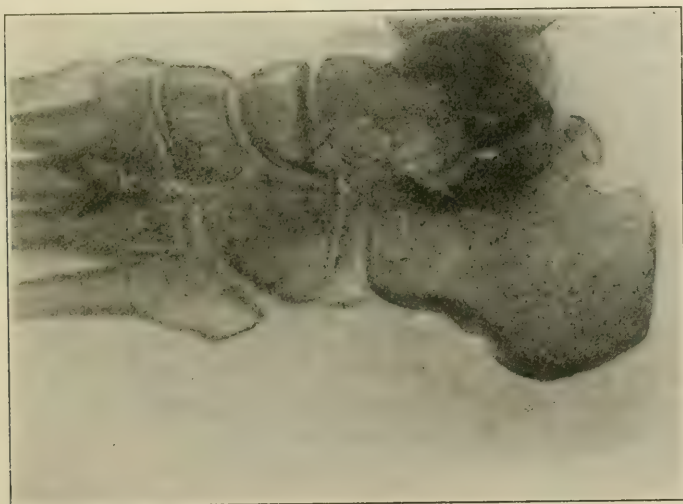
³ *Ibid.*

⁴ *Archiv. f. klin. Chir.*, 1906, vol. lxxviii, p. 929.

the tuberosity of the fifth metatarsal bone and the posterior process of the astragalus. It is copiously illustrated with *x*-ray pictures. The chief object of this paper is to demonstrate that the separation of these two processes from their respective bones is usually due to a traumatism and is a true fracture. In the past, surgeons and anatomists, when these pieces of bone were found separate, looked upon them as of congenital origin, one corresponding to the posterior process of the astragalus and called *os trigonum*, and one corresponding to the tuberosity of the fifth metatarsal called the *os Vesalianum*.

The fracture, unless borne in mind and looked for in the *x*-rays, is always overlooked in the recent state. Lilienfeld considers them,

FIG. 12



however, typical and not rare. The usual traumatism is a misstep, and on account of muscular attachments, they are often tear-fractures. Fig. 11 demonstrates clearly the separation of the tuberosity of the fifth metatarsal, which might be looked upon as a separate bone. Fig. 12 shows the separated posterior process of the astragalus. These two fractures may be observed in combination with that of the *os calcis*. When recognized in the recent state good results are obtained by simple fixation for about ten days, followed by massage.

Kirchner¹ considers the possibility of fractures of the metatarsal bone from indirect trauma, and reports cases where the absence of direct trauma, the *x*-rays demonstrated splintering of one or more metatarsal bones with, or without, dislocation of the fragments.

¹ *Archiv. f. klin. Chir.*, 1905, vol. lxxvii, p. 241.

FRACTURES AND DISLOCATIONS OF THE TARSAI BONES. Pels Leusden¹ calls attention to a very interesting sprain associated with a fracture in the so-called talocrural joint, that is in the articulation of the astragalus with the tibia. Fracture usually follows forced plantar flexion. The astragalus is forced against the tibia, the ligaments are torn, and there is a fracture of the posterior rim of the joint. This posterior piece of the tibia is forced backward, the outer malleolus may or may not be fractured. On examination one finds that the heel is dislocated backward, the dorsal surface of the foot is shortened, the fossæ on each side of the tendo Achillis obliterated, there is usually great swelling about the ankle, and the fracture is only made out in a lateral *x*-ray.

Reduction should be attempted by plantar flexion, traction on the toes, then dorsal flexion with pressure on the anterior part of the tibia. If this fails, operation is indicated.

FRACTURES OF THE SCAPHOID (OS NAVICULARE). This fracture is comparatively rare. Bergmann² reports three cases recently observed with *x*-ray examination. Quite frequently the injury is due to indirect force, the patients jumping on the toes with the foot in plantar flexion, the scaphoid is crushed between the astragalus and the cuneiform and broken into three or four pieces. There may be no dislocation. With greater force the dorsal fragments are pushed beneath the tendons on the dorsum of the foot and the astragalus slips in their place. When there is no dislocation the fracture cannot be recognized without an *x*-ray. When the fragments dislocate, a diagnosis of a luxation of the scaphoid bone may be incorrectly made. Since the introduction of the *x*-rays isolated dislocation of the scaphoid has not been observed. In reducing the fragments the toes are grasped, extended, the foot flexed plantarward and abducted. These manipulations are designed to increase the space between the astragalus and the cuneiform bone; now pressure upon the dislocated fragments may reduce them. According to Bergmann, on account of the irregularity of the surfaces of the fragments, this is often impossible. The best dressing is a splint of felt molded to the plantar arch of the foot, extending up the calf of the leg, fixed with a roller bandage with much cotton over the dorsum of the foot. In the cases with dislocation, according to Bergmann the ultimate function is bad. For this reason I believe that if the fracture is recognized in the recent state and the dislocated fragments cannot be reduced, an open incision which would be a very simple operation should be employed. I can find no cases of this character.

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 501.

² Deutsch. Ztschr. f. Chir., 1905, vol. lxxx, p. 199.

Momburg¹ discusses a very important and unique observation of his own which again brings up the question discussed by Lilienfeld in regard to *supernumerary bones*. Momburg's patient claimed permanent disability after a very slight misstep. After the injury there was no discomfort until one month later, and the man, a mechanic, did not claim his disability for over a year. The *x*-rays demonstrated that the scaphoid was composed of two pieces, but there was no evidence of callus formation, and as a smaller rudiment in a similar place in the opposite foot was found in the *x*-rays.

Momburg looked upon the lesion not as a fracture, but as a supernumerary bone. In addition, as the patient was overweight and had double flat-foot the symptoms were ascribed to this deformity and the indemnity was not granted. How Lilienfeld would explain this observation of Momburg I do not know. The observation, however, demonstrates the difficulty of a proper interpretation of *x*-ray negatives, especially in those regions where supernumerary bones are possible. I must confess, however, that I agree with Lilienfeld that a piece can be separated and callus formation may not follow; that older anatomists have described these supernumerary bones is no positive evidence that the possibility of separation by trauma can be excluded.

Dr. McGlannan, of Baltimore, has just shown me an *x*-rays of both knees. At the junction of the inner condyle with the shaft of the right knee there is a small separated piece of bone not present on the opposite condyle. Three months ago this patient, a laborer, aged forty-five, received a contusion of the right knee which was treated for a sprain. At the present time there is tenderness and some swelling over the internal condyle, there is no restriction of joint motion and no crepitation. This observation is a good demonstration of the importance of an *x*-ray study after a recent injury, and no one should make a diagnosis of a sprained joint unless fracture is positively excluded by the *x*-rays, whenever this is possible.

FRACTURES OF THE OS CALCIS. The most recent extensive communication on this subject is presented by Voekler.² The reproduction of his *x*-rays in his first communication were so poor that he presented them again as tracings in the second communication.³

We may recognize in the os calcis tear, transverse, comminuted, and compression fractures. A correct diagnosis can only be properly made with an *x*-ray. In a typical *tear* fracture with displacement upward of the fragment reported by Helbing,⁴ the line of

¹ Archiv. f. klin. Chir., 1905, vol. lxxvii, p. 295.

² Deutsch. Ztschr. f. Chir., 1906, vol. lxxxii, pp. 175 and 611.

³ Ibid., p. 611.

⁴ Deutsch. Ztschr. f. Chir., 1901, vol. lviii, p. 489.

fracture is not on the walking surface of the os calcis. The patient was a heavy woman, who, making a misstep, came with her entire weight on the ball of the toes. The fracture, therefore, was probably due to the muscular action of the gastrocnemius. The *x*-ray was taken six months after the injury, and, although there is no union, except at the apex of the triangle, the patient has good function. Therefore, in similar cases it is apparently not necessary to operate in the recent state and suture the fragments. Helbing found but two similar cases in the literature, but I find identical cases pictured by Scudder and Helferich in their special works, and Vöckler reports a similar case. Helferich's case was subjected to operation.

The *transverse* fractures are due to direct force, the line of fracture is vertical and extends through the os calcis into the walking surface; the triceps tendon pulls the fragment up. Healing, therefore, in this dislocated position will lead to very bad function; operation is indicated in the recent state, and good functional results should be obtained.

Compression fractures are best described and illustrated by Mertens.¹ One of his nine cases was a tear fracture similar to the case of Helbing. Mertens recognizes compression fractures of a slight and grave degree. In the more severe cases the diagnosis can be made from the clinical picture alone, in the lighter cases the fracture will be overlooked unless an *x*-ray is taken. Scudder's diagrammatic illustration of fractures of the os calcis in his text book give the impression that the line of separation between the fragments is sufficiently marked to show in the *x*-rays, while the illustrations of Mertens and those in Helferich's atlas on fractures demonstrate that in the compression fracture the diagnosis rests on changes in the density of the shadow, its irregularity, the loss of the typical lamellar architecture, and difference in the shape of the bone. Mertens was able to confirm this in an interesting experimental work. In this form of the fracture the functional results are usually bad—the bone is tender and flat-foot may develop. As regards treatment, it is yet unsettled how better results can be obtained. Early massage is important, and in some cases a plate should be worn to support the arch of the foot.

In *comminuted* fractures the functional results are also not good.

FRACTURES OF THE ASTRAGALUS. Couteaud² describes a remarkable fracture of the astragalus in which it was necessary to remove the dislocated fragment. The patient, a male aged twenty-three years, fell on the foot in a varus position; after the accident the patient succeeded in turning the foot out, then he noticed something to protrude from

¹ Archiv. f. klin. Chir., 1901, vol. lxiv, p. 899.

² Centralbl. f. Chir., 1906, vol. xxxiii, p. 711.

the ankle on the dorsum of the foot. When examined twenty-four hours after the accident there was very little swelling, but a movable piece of bone could be felt on the dorsum of the foot on the outer side. Under ether this could not be reduced, nor after an open incision. For this reason the fragment, which consisted of a large part of the astragalus, was removed. The patient was allowed to walk with crutches after five weeks, and at the end of ten weeks he had good function.

Thienaus,¹ of Milwaukee, observed his case four months after the injury. In its recent state, reduction under anesthesia had been

FIG. 13



unsuccessful. The *x*-rays show a fracture of the astragalus (Fig. 13). The lower fragment and the foot are dislocated forward. In this case the entire astragalus was removed, and the functional result four months after operation was excellent. Thienaus calls attention to the monograph of Deetz.²

DISLOCATIONS IN THE REGION OF THE ANKLE-JOINT. On this subject there have been a number of important recent communications.

¹ *Annals of Surgery*, February, 1906, vol. xliii, p. 295.

² *Deutsch. Ztschr. f. Chir.*, vol. lxxiv, p. 581.

We have another evidence of the value of the *x*-rays. Cases thus studied demonstrate that dislocation without fracture is comparatively infrequent, and some of the older observations recorded as pure dislocations have not been confirmed in the recent cases with the Röntgen pictures. Trendel¹ classifies these dislocations *first* into talo-crural; in this instance the entire foot is dislocated from the bones of the leg; in the majority of such injuries one or both malleoli or

FIG. 14



FIG. 15



FIG 16



the fibula are fractured (Pott's fracture belongs to this group). In the *second* variety, the astragalus (talus) is dislocated not only from the bones of the leg, but from its connections with the other tarsal bones. Such an injury might be called an isolated dislocation of the astragalus. In the *third* variety the astragalus, or at least that portion which articulates with the tibia and fibula, is dislocated.

¹ Beit. zur klin. Chir., 1905, vol. xlv, p. 360.

These are called subastragaloid dislocations and are frequently associated with fracture of the astragalus.

DISLOCATIONS OF THE ANKLE, OR TALOCRURAL JOINT. Ebel¹ contributes the best discussion of this injury and brings out the fact that the dislocation is usually associated with a fracture of the lower third of the fibula, or one or both malleoli. He adopts the German classification, which looks upon the dislocation as one of the foot. The foot may be displaced from the bones of the leg anteriorly or posteriorly, or laterally. The diagnosis of the dislocation is not difficult, but the positive demonstration of a fracture frequently is. Ebel clearly brings out that it is the exception to have a pure dislocation. The treatment in the recent state is not difficult, and good results should be obtained by early reduction under anesthesia. It is very important that an *x*-ray be made immediately after treatment, to demonstrate that the correct position has been obtained. In one of Ebel's best results no bandage was employed. It is my opinion that a simple fixation dressing is sufficient. If the dislocation has been associated with a fracture of one or both malleoli, massage and passive motion should be employed with great care in the first two weeks.

Fig. 14 shows anterior dislocation with fracture of the internal malleolus. Fig. 15 shows posterior dislocation with fracture of the lower third of the tibia, and Fig. 16, outer and lateral dislocation with fracture of the malleoli. These illustrations demonstrate the simplicity of the *x*-ray diagnosis and the facility of reduction.

Richter² reports a case of posterior dislocation with fracture of the fibula. It was observed in the recent state, and the *x*-rays shows perfect reduction. He collects all the cases of this form of dislocation from the literature and since the introduction of the *x*-rays was not able to find a single observation without fracture, confirming in this respect Ebel's observations.

SUBASTRAGALOID DISLOCATIONS. Thienhaus³ case (see Fig. 13) is an example of a forward subastragaloid dislocation with fracture. Deetz⁴ collected all the cases in 1904 and Trendel⁵ adds new cases up to 1905.

These dislocations are classified in the same manner as the talocrural. Fracture of the astragalus is very frequent. Reduction in the recent state is often impossible. However, when this fails, one should operate at once. With careful dissection and a proper knowl-

¹ *Beit. zur klin. Chir.*, 1904, vol. xlv, p. 601.

² *Deutsch. Ztschr. f. Chir.*, 1905, vol. lxxvii, p. 246.

³ *Loc. cit.*

⁴ *Loc. cit.*

⁵ *Loc. cit.*

edge of the anatomy reduction is usually possible, whether fracture be present or not. When reduction is impossible and in older cases, good results are obtained by partial or complete excision of the astragalus. When the entire astragalus is removed one should chisel the articulating cartilage from the surfaces of the tibia, fibula, and os calcis, and place the os calcis within the fork of the bones of the leg. According to Trendel the comparative frequency of the different dislocation is as follows: lateral-in (adduction dislocation), forty cases; combination of inward and posterior, nine cases; lateral-out (abduction dislocation), sixteen; combination of outward and posterior, five cases; an anterior, five cases; posterior, seven cases. The inward dislocation is therefore the most frequent, the anterior the least frequent; lateral dislocations are frequently combined with a posterior position of the foot. The case reported and illustrated by Deetz is practically identical with that of Thienhaus, except it was observed on the fifteenth day and complete reduction was possible at the open incision. The permanent functional result was excellent, although there was a slight varus deformity.

Trendel's case was an inward dislocation of the foot with fracture of the astragalus. The injury was observed in the recent state, and apparent reduction made under ether; an *x*-ray a few days afterward demonstrated that the position was not correct. Other unsuccessful attempts were made at reduction. Six months later it was necessary to excise the astragalus. The mistake made here was the failure to operate when the *x*-rays demonstrated incomplete reduction.

Wendel¹ reports an inward subastragaloid dislocation without fracture, in which reduction was impossible in the recent state. However, at the open incision the impediment to reduction, a muscle was found relieved, and complete anatomical restoration obtained.

In the *Annals of Surgery*, 1899, vol. xxix, p. 646, one will find two beautiful photographs of plaster casts illustrating an inward subastragaloid dislocation by Dr. W. B. Hopkins, of Philadelphia. He states that there was no fracture and that reduction in the recent state was performed without difficulty.

SPRAINS OF ANKLE-JOINT. The previous discussion might give the impression that injuries about the ankle are chiefly fractures and dislocations. This, of course, is only partially true. The most interesting study of the injuries not associated with fracture or complete dislocation has been made by Vorschütz.² His article is based upon a careful study of a large accident service and is entitled, "The

¹ Deutsch. Ztschr. f. Chir., 1905, vol. lxxx, p. 251.

² Ibid., p. 559.

Diastasis of the Bones of the Leg in Distortions of the Ankle-joint." A diastasis may be described as a condition in which the motions of the bones forming the joint are possible beyond their normal limits, and is due to a rupture of the joint capsule or ligaments. In these cases, if the force continued a fracture or true dislocation would take place. Such injuries of the ankle-joint are very frequent, usually due to indirect force with the foot in the inward or adducted position. After the injury, swelling and ecchymosis are frequent, pain and restriction of motion marked. Dislocation and fracture can only be excluded by the *x*-rays. Treatment is a very important factor and should bear in mind that the ruptured ligaments require time for healing as much as a fractured bone. In the ankle, failure of treatment frequently results in flat-foot. Vorschütz recommends for grave cases Bardenheuer's extension treatment; this keeps the patient in bed three weeks. Extension is maintained by lateral adhesive straps attached to a pulley. These adhesive straps produce lateral pressure, but allow a certain amount of passive and active motion in the joint and massage. In lighter cases Vorschütz advises the support of the foot and ankle by imbricated adhesive straps which he calls the American method of Gibney. The chief point made by this surgeon is that in grave sprains with demonstrable diastasis of the bones of the leg the patient should not bear weight on the foot for at least three weeks, whatever other method of treatment may be employed. My experience confirms this statement, and I believe if it were followed out, the orthopedic surgeons would note a large decrease in the number of their cases of flat-foot.

FRACTURE OF THE BEAK-SHAPED PROCESS OF THE TIBIA. This interesting epiphyseal fracture, which occurs usually at about fourteen years of age, I have previously discussed.¹ Dr. Winslow writes me that his patient on whom an exploratory operation was performed has no further trouble, and the two patients whom I saw with Dr. Cassidy are now entirely free of symptoms. Dr. Baer informs me that a few cases have been observed in his orthopedic clinic, heretofore overlooked. Lanz² reports a few cases, but the most extensive article is found in the French literature, by Gaudier and Bouret.³ Their personal observation is of special interest, because it was observed in the recent state, and, after the primary swelling had subsided somewhat a correct diagnosis was made. In addition, on account of the dislocation of the fragment upward and its impaction in the joint, operation was necessary. Their patient was a boy seventeen years

¹ PROGRESSIVE MEDICINE, December, 1903, p. 145, and December, 1905, p. 223.

² Centralbl. f. Chir., 1906, vol. xxxiii, p. 351.

³ Revue de Chir., 1906, No. 9, p. 305.

of age, who fell from a parallel bar with the knees flexed and legs crossed; after striking the ground in this position the body bent backward, this mechanism undoubtedly produced a tear fracture. The boy immediately lost use of the left knee. At an examination a few minutes after the accident there was too much swelling for palpation, but his inability to extend the leg at the knee pointed to a rupture of the patella or its ligamentary apparatus. After forty-eight hours in a retentive bandage in full extension the swelling had disappeared sufficiently to allow palpation—there was no fracture of the patella, which, however, was dislocated upward. Beneath the patella, apparently in the joint, a piece of bone could be felt and beneath this the defect at the position of the tubercle of the tibia. The *x*-rays (Fig. 17) confirmed the diagnosis, and, on account of the displacement of the

FIG. 17

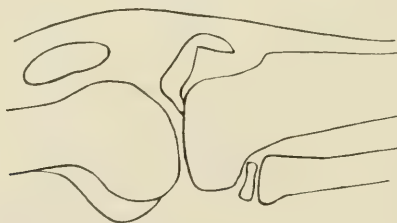


FIG. 18



fragment, operation was indicated. On the twelfth day after the accident a U-shaped incision exposed the fracture; the fragment was composed of two pieces held together by periosteum and fascia. The fragment was replaced with great difficulty and held in position by a nail (Fig. 18). The wound was closed without drainage. Passive motion and massage were begun on the eighth day, and the patient was allowed to walk on the twenty-first; function was completely restored at the end of two months.

In injuries about the knee-joint with inability to extend the leg one must bear in mind not only this fracture, but that of the patella, complete or partial rupture of the quadriceps tendon and dislocation of the semilunar cartilage.

DISLOCATION OF THE SEMILUNAR CARTILAGE OF THE KNEE-JOINT. In *PROGRESSIVE MEDICINE* for December, 1899, this injury was carefully considered. The important points in Schlatter's¹ communication may be summarized as follows: The left knee and the internal meniscus are most frequently involved; at the time of the injury there is sudden pain and fixation of the joint in flexion, and inability to extend; the patient, as a rule, is able, by a manipulation, to overcome the locking of the joint; very few surgeons see the injury in the recent state, the great majority of cases come for treatment later when there is a history of recurrent attacks. Schlatter was unable to confirm v. Bruns' statement that the cartilage protruded when the leg was extended and disappeared when it was flexed. In his five cases the reverse was true in four. The diagnosis, therefore, is usually not difficult. The best treatment is removal of the dislocated meniscus. Schlatter was able to ascertain the ultimate results, and finds that the immediate result for a year is almost perfect; after that the patients state that the knee is not as strong and fatigue is earlier, though still incomparably more serviceable than before operation. One surgeon observed arthritis deformans after operation—a unique observation among a fairly large number of cases. Schlatter claims that after the English method of suture recurrences have taken place. My experience teaches me that, in the recent state, reduction and fixation should be the method of treatment. The extended position is the one of preference, but if the cartilage can be palpated in this position, as in v. Bruns' cases, the knee should be fixed in a slightly flexed position. In all other cases in which the dislocation is recurrent, operation is indicated. Now and then a thickening of the joint capsule due to some form of chronic arthritis cannot be differentiated from the cartilage lesion, but, as operation is indicated in both, a correct diagnosis will be made at the exploratory arthrotomy

DISEASES OF THE BONES.

Osteomyelitis. In *PROGRESSIVE MEDICINE* for December, 1899, p. 218, I discussed the following questions: the bacteriology of pyogenic osteomyelitis, its common occurrence in infancy, the rare involvement of pubic bones, the bending of bones in chronic osteomyelitis, the more recent views on etiology and pathology, the unusual occurrence of a malignant epithelial invasion through sinuses into the bone cavity in chronic cases, the importance of the total resection of the diaphysis in the very acute form, and the extreme importance of early recognition

¹ *Beit. zur klin. Chir.*, 1904, vol. xli, p. 229.

and drainage of the pus foci. The subject was not again taken under consideration until December, 1904, p. 194. At that time Lexer's splendid contribution to the arterial circulation of the various bones was described and illustrated, and the relation of these arterial branches to the well-known common position of the focus of the disease in osteomyelitis and tuberculosis discussed. This contribution, together with Fränkel's investigation on the bacteriology of the bone-marrow, shared with Nichols' contribution on regeneration of bone after subperiosteal resection the honor of the most important and interesting contributions of that year. A unique focus of osteomyelitis—in the patella—was described. The literature since 1904 on this subject is unusually scanty, especially in American and English periodicals.

Osteomyelitis is a very common disease, both in its acute and chronic form, the clinical picture is often obscure, and a mistaken diagnosis is not infrequent. It is a subject to which not only the general practitioner, but the surgeon in this country, should give more attention. On its proper recognition and prompt treatment depends in many cases not only the life of the patient but in every instance the future function of the limb.

SUBPERIOSTEAL EXCISION OF THE SCAPULA FOR OSTEOMYELITIS. This contribution, which has excited my greatest interest, was overlooked when I referred to Nichols' work in 1904. Bockenheimer¹ in discussing his experience and the literature on excision of the scapula not only confirms the work of Nichols in regard to regeneration of bone after subperiosteal resection, but brings out facts of immense importance in regard to diagnosis and treatment when the scapula is involved.

From an historical standpoint, it is noted that the first observation of regeneration of bone was made by Charles White, of Manchester, in 1768. He removed subperiosteally the head of the humerus for osteomyelitis apparently at a time considered by Nichols most favorable for regeneration, that is, after the periosteum had begun to form some new bone. White was surprised to find complete regeneration and good joint function. In 1786 two French surgeons, Chaussier and Vermandois, in a series of experiments on dogs failed to get regeneration of bone, which was successfully accomplished by Bernhard Heine, in Würzburg, in 1830. The specimens obtained in this experimental work are still in the collection of the Anatomical Institute of Würzburg, some of which are illustrated by Bockenheimer. This knowledge was slowly utilized by surgeons. In 1858 Ollier again established the osteogenetic power of the periosteum. Von Langenbeck, who had seen Heine's preparations in Würzburg, was one of the first surgeons to establish subperiosteal joint resection, based

¹ Archiv. f. klin. Chir., 1904, vol. lxxv, p. 1.

upon this knowledge of bone regeneration if the periosteum is left intact and with good nutrition. Although Cumming in 1808 was the first to completely excise the scapula (for a gunshot wound) he did not know that there would be complete regeneration if the periosteum were left. Von Langenbeck and Fergusson were the first to deliberately remove the entire scapula subperiosteally with the idea of conservative surgery and future restoration of the bone by periosteal regeneration.

The three cases of *osteomyelitis of the scapula* reported by Bockenheimer illustrate the important points in pathology, diagnosis, and treatment. On account of the swelling in the region of the shoulder a diagnosis of a focus in the head of the humerus or shoulder-joint is often made. The medullary tissue present in the spine, body, and processes of the scapula is not continuous as in a long pipe bone, but separated by cortical bone without medullary spaces. As the foci are usually multiple the drainage of one is not sufficient. The infection of this bone is characterized by a rapid course. On account of its thick muscular envelope the pus pockets when they break through the periosteum, are often concealed, especially anteriorly, and the pus is prevented from reaching the axillary cavity by the subscapular muscle. According to Bockenheimer an axillary abscess is a positive indication of a complete involvement of the marrow centres in the scapula, and should urge the surgeon to immediately perform complete subperiosteal excision of the scapula. Single foci are rare. If they can be recognized before other areas of the scapula are involved, opened and drained, total resection is not indicated. But, unfortunately, in the majority of cases, there are other foci, very little change in the clinical picture is observed after the drainage of one, and the patient may die of general infection before the condition is recognized and properly treated. In the more chronic forms, with multiple sinuses, patients are usually subjected to repeated operation, which fail to accomplish healing. The majority of surgeons, not familiar with the work of Bockenheimer and others, will naturally hesitate, both in the acute and chronic lesions, to perform the apparently radical and mutilating operation of total resection. But there is no doubt that in the acute condition total excision will save life, and in the chronic form, time and repeated operations. In both, the bone is rapidly reproduced from its periosteal envelope, and function of the shoulder-joint, even though the glenoid cavity be removed, is perfectly restored. To accomplish such results one must be familiar with the proper method of subperiosteal resection and the after-treatment which Bockenheimer emphasises as essential to restoration of function.

The first case recorded by Bockenheimer died of septicemia, and the focus in the body of the scapula was not found until the autopsy. The patient, a girl aged three years, was admitted on the sixth day of

the disease with pain and swelling in the region of the shoulder, fever and jaundice. The swelling of the shoulder extended over the scapula, and the axillary fossa was obliterated; the swelling extended down the arm and an incorrect diagnosis of osteomyelitis of the upper end of the humerus was made. At the first operation pus was encountered on making an incision over the upper third of the arm; as this did not relieve the picture of infection, the shoulder-joint and the head of the humerus were explored, but no pus focus exposed. The patient succumbed twenty-four hours after operation. The swelling over the scapula and in the axilla should have made one suspicious of scapula involvement.

In the second case a correct diagnosis was made and treatment was successful. The patient was a boy, aged twelve years; on admission, three days after the onset, there were pain and swelling over the shoulder-joint, restricted and painful motion of the shoulder-joint; the general condition was good. In addition, the swelling extended to the scapula, over its spine the skin was red, and there was local tenderness. An incision, opened a subperiosteal abscess, and chiselling of the bone found a pus focus in the spine. The condition of the medullary tissue in the spine of the scapula was that observed in the earliest stage of osteomyelitis—very hemorrhagic marrow in which pus could only be found with the microscope; cover-slips and cultures demonstrated the staphylococcus pyogenes aureus. As the drainage of this focus did not relieve the fever, two days later total subperiosteal resection was performed. Examination of the specimen demonstrated that all the marrow spaces were infected. Bone regeneration was rapid and practically complete, as shown in an *x*-rays eighteen months after operation. This patient left the hospital four weeks after operation with considerable motion in the shoulder-joint, but received careful after-treatment in the dispensary. It is very surprising to learn that this patient was able to return to his former occupation, that of an acrobat. This observation is sufficient evidence of complete regeneration and shoulder-joint function after total excision.

The third case is an example of total resection for the chronic lesion. The patient was a boy, aged fourteen; the acute onset dates from his fifth year, since which time there have been fistulæ, which would discharge bone, heal and break out again, and repeated unsuccessful operations. This patient came into the clinic with an acute flare-up associated with the closure of the fistula. The *x*-rays showed foci in all the marrow spaces of the scapula confirmed by the examination of the specimen after total extirpation. In this case the operation was more difficult on account of the scar tissue, and was associated with shock. The

regeneration of bone and joint function was in the end equal to that in the previous case.

Method of Operation. The incision should begin at the apex of the acromion and extend along the spine of the scapula to the medial border; a second incision is made along the entire length of the medial border. These incisions should cut everything to bone. Now the periosteum is stripped back with all the muscle attachments. In the region of the glenoid cavity one must be careful of the suprascapular nerve, which passes over the neck of the scapula and the nervus axillaris, which comes around the outer border of the scapula below the glenoid cavity. To aid in the dissection, saw through the acromion at the junction with the spine and divide the coracoid process at its base. In infected cases drainage should be employed.

After-treatment. For the first week the arm can be fixed to the side of the body. After that the arm should be held in abduction and outward rotation on a Middeldorpf triangular splint. Passive motion should be begun in the second week. After the third week, in addition to passive motion, the patient should attempt active motion. The importance of motion and massage is to prevent muscle atrophy and to make a new joint in the bony process which forms in the position of the removed glenoid process. After the second week daily massage and passive motion should never be neglected, and this should be continued until bone regeneration allows the patient to use the arm without fixation. The most important position in which the arm should be constantly placed is elevation, abduction, and outward rotation.

The best results are obtained in osteomyelitis, because, as a rule, the periosteum is uninjured, and shortly after the onset of the infection it begins to produce bone. The results should be good in gunshot wounds and fractures. In tuberculosis the periosteum is usually involved and for this reason regeneration of bone is less complete. In new-growth, in which the periosteum generally has to be removed, one cannot expect regeneration. The function, however, can be improved by a second operation in which, by transplanting the pectoralis major and trapezius, they are made to act as elevators and outward rotators of the arm.

X-RAYS IN OSTEOMYELITIS. Ritter¹ states that in the early stage the *x*-rays give no information, and he cautions against frequent exposure of the affected limb to the Röntgen rays. In his experience it has inhibited healing. In later stages the *x*-rays give valuable information. The new periosteal bone gives an irregular shadow to the shaft, and the pus cavity and sequestra in the medullary cavity appear as light areas and irregular dark lines.

¹ Centralbl. f. Chir., 1906, vol. xxxiii, p. 37.

BACTERIOLOGY OF OSTEOMYELITIS. Courmont and Lesieur,¹ in their clinical and experimental work, refute the statements of Henke that there is a specific staphylococcus pyogenes aureus for osteomyelitis. Since the discussion in 1899 and 1904 nothing of importance has been added to this subject. Osteomyelitis may be produced by any pus producer, the aureus is the most common, the streptococcus and pneumococcus next; the typhoid bacillus is not an infrequent factor. I have been unable to find an authentic case in which the gonococcus had primarily involved the bone. The clinical picture and pathological findings in osteomyelitis from various micro-organisms differ very little. This was discussed in December, 1899.

OSTEOMYELITIS ACTINOMYCOTICA. Wrede² in his study of the literature finds that the ray fungus rarely invades bone. This usually takes place by direct invasion from the soft-part focus. He was able to find in the literature but three positive observations of metastatic hematogenic infection of the bone with this fungus. In all of these cases the lungs were involved, and there were soft-part foci. The bone lesion gave very few clinical symptoms. In a case observed by himself the infection in the upper end of the femur at first seemed to be primary and single lesion, but after more careful investigation, foci in the lungs and soft parts were demonstrated.

Bevan³ recommends the internal administration of copper sulphate in doses of one-fourth to an eighth of a grain.

OSTEOMYELITIS IN INFANCY. Mohr⁴ in his excellent discussion of the literature and a report of two cases of his own adds nothing new to the subject which we discussed in December, 1899. In infancy the clinical picture, in its onset, cannot be differentiated from primary arthritis. The lesion is usually multiple. If the infant does not die of general infection the prognosis is good for ultimate function. This is due to the fact that the softness of the bone allows the pus to find an easy outlet. There are cases of spontaneous recovery. The chief complication in neglected cases is joint infection and epiphyseal separation. Mohr had an observation of spontaneous recovery. The child was but four weeks old and was admitted to the clinic two weeks after an injury to the hip. The leg was held in flexion, inward rotation and adduction; the trochanter was swollen and tender. Under rest the symptoms subsided. Two years later there was no evidence of restricted function. Of course, in this case the diagnosis rests upon the clinical picture only. In the second case, that of a child aged four months,

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 884.

² Ibid., 1906, vol. xxxiii, Suppl. p. 27.

³ Jour. Amer. Med. Assoc., November 11, 1905.

⁴ Centralbl. f. Chir., 1905, vol. xxxii, p. 506.

an abscess beneath the great trochanter was incised. Two years later there were two centimeters' shortening.

OSTEOMYELITIS OF THE COCCYX. The case reported by Monnier¹ is of interest on account of its rarity. The patient was a girl, aged seventeen. On account of the clinical picture of fever a diagnosis of typhoid was made. The appearance, however, of an abscess in the region of the coccyx gave explanation of the fever, and the bacteriological and operative findings allowed a correct diagnosis.

RAREFYING OSTEOMYELITIS. Langer² describes the clinical picture and pathological findings, which must be very unusual in pyogenic osteomyelitis. The pus foci were multiple, and, associated with this, all the bones of the extremities showed marked rarefaction. The patient was a boy, aged twelve years, the focus first to appear was in the metacarpus. In this instance it was associated with a sequestrum. Later it was necessary to amputate the arm for multiple foci. These areas in the marrow had very little to allow their recognition with the naked eye; but under the microscope the hemorrhagic marrow tissue contained pus cells and streptococci; the surrounding spongiosa was very porous, and the corticalis very thin. At the operation the humerus fractured under the application of the Esmarch, and the bone could be cut with knife or scissors. The *x*-rays showed this condition of osteoporosis in the bones of the lower extremities, but there was no clinical evidence of streptococcus infection. Langer attributes the peculiar bone changes to streptococci. The case impresses me rather as one of idiopathic osteopsathyrosis with secondary streptococcus infection.

INFECTIOUS ANEURYSM IN ACUTE OSTEOMYELITIS. Ruge's³ very detailed report of an aneurysm of the left coronary artery, in the course of a septicopyemia after an acute osteomyelitis of the femur, is only an example of one of the possible complications that this infectious disease has in common with other infections. I have observed in the last ten years four cases of endocarditis in acute osteomyelitis. All of the patients recovered with a crippled heart.

Osteomalacia. The occurrence of this rare disease of bone in children and men I have mentioned.⁴ In 1900 two interesting collective reviews appeared. Laufer,⁵ of Vienna, considers the literature since 1895 on the pathology and treatment of osteomalacia in women, and Hahn⁶ on the disease in men. These two reviews should be consulted in the

¹ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 333.

² *Ibid.*, vol. xxxiii, p. 326.

³ *Deutsch. Ztschr. f. Chir.*, 1905, vol. lxxx, p. 151.

⁴ *PROGRESSIVE MEDICINE*, December, 1899, p. 215.

⁵ *Centralbl. f. die Grenzgeb. der Med. u. Chir.*, 1900, vol. iii, p. 21.

⁶ *Ibid.*, 1899, vol. ii, p. 593.

original by anyone who desires to become familiar with this interesting disease. The more recent literature is concerned with the relation of osteomalacia to the thyroid and to chronic diseases of the bone, especially Paget's osteitis deformans. Schirmer¹ entitles his contribution, "A Supplementary Study to the Work of Laufer," to which we have referred (see *supra*), and records a case of positive cure. The patient, a girl, exhibited the symptoms of the disease at eighteen years of age; four years later, when there was no doubt as to diagnosis, ovariectomy was performed. This was followed by gradual improvement, and at the end of three years there were no symptoms of the disease, and *x*-rays studies were negative. This patient died of a perforating tuberculous ulcer of the intestines seven years after the onset of the osteomalacia; the gross and microscopic study of the bone at autopsy found no evidence of the old trouble, except in the deformity of the pelvis.

Hönnicke,² in a monograph, investigates the relation of osteomalacia to lesions of the thyroid and to phosphorus elimination. The observation on which he based his investigation was a male patient aged forty-seven; in addition to insanity, the enlarged thyroid, and clinical picture of exophthalmic goitre, there was kyphoscoliosis and other slight manifestations of osteomalacia. The correct knowledge of the bone lesion was only obtained at the autopsy. With this stimulus Hönnicke investigated a large material, with the conclusion that osteomalacia is a disease of the thyroid gland in which the bone changes depend upon lesions of the thyroid. He is of the opinion that the thyroid has much to do with phosphorus elimination, and in many lesions of this gland the elimination of phosphorus is increased; he believes that the removal of the ovaries is of therapeutic value in that it decreases the elimination of phosphate, but that this is uncertain. He advises the partial removal of the thyroid. I am not at all impressed with these conclusions, nor do I think the problems in this disease are by any means solved. In my own experience with lesions of the thyroid gland I have never observed any relation to the osseous system. I feel that experimental work and clinical observation have demonstrated that proper thyroid secretion is necessary to bone formation. Beyond this we have as yet no positive knowledge, nor do I think it is yet proved that Paget's disease is a later stage of osteomalacia.

Osteitis Deformans, Paget's Disease (Osteitis Fibrosa Deformans). Gaugele³ in reporting an observation of his own and considering the literature takes exception to the diagnosis of Rehn—multiple giant-cell sarcoma—and places it among the others as examples of osteitis fibrosa with

¹ *Centralbl. f. Chir.*, 1906, vol. xxxiii, p. 88.

² *Ibid.*, 1905, vol. xxxii, p. 572.

³ *Ibid.*, 1906, xxxiii, p. 795.

deformity. I shall discuss Rehn's case and a more recent one by Crile under multiple giant-cell sarcoma. Gaugele concludes that this disease—osteitis fibrosa with deformity—may affect one or more bones, or the entire skeleton. The bone-marrow is replaced by an edematous fibrous tissue, and the hard cortical bone becomes softened. In the connective-tissue splits or spaces of the edematous, newly formed, medullary fibrous-tissue cysts may develop which are either hemorrhagic or serous and have no definite cell lining; single and multiple giant-cell tumors are not uncommon, but they should be looked upon not as neoplasms, but inflammatory new formations which later change into fibrous tissue.

This picture of the disease is somewhat different from osteomalacia on one hand, and Paget's osteitis deformans on the other. Whether the three are different stages of the same pathological entity is not yet settled, but after reading Gaugele's communication I am more inclined to look upon Crile's and Rehn's cases as examples of some form of chronic osteitis deformans in which giant-cell tumors or inflammatory areas are part of the general process.

Daser's¹ observation is very suggestive that in the onset of osteitis deformans (Paget) osteomalacia is present. His patient was a female, aged fifty; the symptoms of the disease began sixteen years ago, after the birth of her sixth child and consisted of pain and progressive bending of the long bones (especially the femur) and curvature of the spine. When the patient came under Daser's observation bending had ceased, there were only the resultant deformities, and the *x*-ray picture showed great thickening of the corticalis and narrowing of the narrow spaces. In the stage of osteomalacia the corticalis is thin and the narrow spaces dilated; many patients succumb in this stage. Those that survive show new bone formation which leads to the clinical and pathological picture of Paget's disease. In other cases, instead of the change to Paget's disease, there is a new-growth of fibrous tissue, with or without cyst and giant-cell tumor formation, that is osteitis fibrosa deformans, of which the cases reported by Gaugele, Rehn, and Crile are examples. Katholicky² calls Paget's disease osteomalacia chronica deformans hypertrophica. The case observed by him is of interest because only one tibia was involved. The patient, a woman aged sixty, had observed this bending and enlargement of the tibia ten years; the fibula was normal and straight and looked like the string to a bow represented by the bent tibia. The *x*-rays demonstrated that the entire lamellar architecture of the tibia was changed. At first sight, clinically, this case might be considered one of luetic hyperostosis, which I will discuss later, but

¹ Centralbl. f. Chir., 1905, vol xxxii, p. 1253.

² Ibid., p. 1098.

Katholicky is of the opinion that lues can be excluded. Sonnenberg¹ discusses this obscure disease, first described by Paget, in a report of three cases: a woman, aged sixty-one; a male, aged forty-seven; and a girl, aged sixteen. In the description of the clinical picture he calls attention to the fact that the tibia is usually the first bone to show deformity; other bones become involved in gradual succession. In his *x-ray* studies he finds that the normal lamellar net or meshwork is changed: first, in that the light spaces are larger, and second, in the irregularity of the architecture—a condition, therefore, of osteoporosis. He calls attention to the fact that the pelvic deformity in the woman aged sixty-one resembled that seen in osteomalacia. He cautions against operation for the relief of the deformity, because in one of his patients, a girl aged sixteen, after an osteotomy on the curved tibia, a pseudarthrosis resulted. In a recent article on bone fractures treated by Bier's hyperemia by Deutschländer,² he reports a case of osteomalacia in a girl of ten in whom, on account of the bending of femora and tibiae, osteotomy was necessary to correct the deformity. Fearing non-union he employed artificial obstructive hyperemia beginning on the eighth day. In all four fractures union was solid by the end of six weeks. In this case, according to the reporter, the patient was not in the acute stage of the disease, but in the stage of its resolution; bending had ceased, the bones were no longer soft, so that it is quite possible that bony union would have taken place without Bier's hyperemia treatment. In the literature, fractures with complete bony union have been recorded in all stages of osteomalacia and a few in osteitis deformans.

Idiopathic Osteopsathyrosis. This disease, also called *fragilitas ossium*, or, according to Looser, *osteogenesis imperfecta congenita* or *tarda*, must be differentiated from osteomalacia and osteitis deformans. In older literature the most interesting contribution is presented by J. P. Crozer Griffith.³ The most complete article in recent literature with which I am familiar is by Looser.⁴

Looser's conclusions are so clear that I give them in full.

1. The so-called idiopathic osteopsathyrosis is a clinically and pathologically well-defined disease.

2. It consists essentially of a defective function of the endosteal and periosteal osteoblasts, which, however, are of normal structure. The resorption which accompanies the defective bone apposition is normal and not increased.

3. The consequences of defective bone apposition are a high degree of atrophy of the bones and deficient growth in thickness.

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 1098. ² Ibid., 1906, vol. xxxiii, p. 337.

³ Amer. Jour. Med. Sci., cxiii, p. 426.

⁴ Mittheilungen a. d. Grenzgeb. d. Med. u. Chir., 1905, vol. xv, p. 161.

4. In the finer structure of the bone substance the defective apposition is seen in the great cellularity of the lamellæ, and the granular, crumbling calcification of the cartilage matrix.

5. The epiphyseal cartilages are at first normal; in later stages of the disease regressive changes take place in them, due to a limitation of space for the normally growing epiphyseal disk by the deficient growth of the bony shell including it.

6. The bone formation adjacent to the epiphyseal cartilage progresses normally, but with considerably decreased intensity.

7. The findings in the epiphyseal cartilages illustrate most distinctly two anatomical facts: first, that the longitudinal growth of bone does not depend upon the intensity of enchondrial bone apposition, but merely upon the normal growth of the cartilage and the advancing growth of the marrow spaces in it; second, that the epiphyseal disk, also grew in width independently of the bony shell which enclosed them.

8. The bone-marrow shows normal conditions, and there is fibrous transformation only in places of mechanical irritation (fractures, infraction).

9. The so-called idiopathic osteopsathyrosis and the osteogenesis imperfecta are identical pathologic-anatomical processes. With regard to the clinical onset of the disease there are all imaginable transitions between the congenital form and that which appears in later childhood.

10. The shortening and elongation of the long pipe bones which sometimes occur in osteogenesis imperfecta are of traumatic origin, sequelæ of fractures and crushing injuries of the bone, and of callus formation.

11. It would be well to extend the term osteogenesis imperfecta to include the so-called idiopathic osteopsathyrosis, and, as far as may appear practicable, to distinguish an osteogenesis imperfecta congenita and tarda.

12. The cases of osteogenesis imperfecta occurring in childhood can probably be traced back to congenital changes, osteogenesis imperfecta in the wider sense (see section 11).

13. As to the cause of osteogenesis imperfecta (in the wider sense) general nutritive disturbances must be excluded. Whether, in addition to the deficient function of all bone-forming elements, another cause, probably congenital, can be found, it is impossible to say at this time.

Gloye¹ in reporting a case records bony union after spontaneous fracture and recommends for treatment of the disease phosphorus, cold salt baths, cod-liver oil, and thyroid tablets. Other interesting contri-

¹ Centralbl. f. Chir., 1905, vol. xxxii, p 660.

butions on the same subject have appeared by Döring,¹ Broca and Herbinet.²

Looser's illustrations are entirely microscopic. Döring gives some excellent *x*-ray reproductions.

Rickets. The collective review by Zezas,³ which is not yet completed, I shall postpone for discussion until next year. It appears to be an excellent critical review of the entire subject.

Curschmann⁴ is interested chiefly in the late form, and still considers the question not entirely settled, but apparently he believes in the possibility of late manifestation of rickets. The two cases which he reports belong to this group, and he believes that they can be differentiated from osteomalacia and congenital lues. A rather characteristic symptom of rickets is the expansion of the epiphyseal end of the long pipe bones, absent in the other bone diseases. Curschmann advises in these late cases not to operate for the deformity until the patient has been treated by rest in bed and the administration of phosphorus and cod-liver oil.

Raw⁵ reports some cases of what he calls scurvy rickets with spontaneous fracture. In infantile scurvy (Barlow's disease) subperiosteal hemorrhage after a slight trauma is not infrequent, and fractures may take place. The prognosis is bad. Fränkel⁶ is interested chiefly in infantile scurvy, which he calls Moller-Barlow's disease. He gives the histories and autopsy findings in nine cases which he observed in eight months. The ages of the patients varied from four to twenty-four months; the diagnosis is often not made until autopsy. Further studies with the *x*-rays may aid in the clinical diagnosis. The typical symptoms—bleeding from the gums, pain and swelling of the joints are not always present. In the study of the bones at autopsy the medullary tissue showed hyperemia, and the cellular marrow is replaced by a tissue very poor in cells; subperiosteal hemorrhages and fractures are frequent. Fränkel is of the opinion that infantile scurvy and rickets are two distinct diseases, but the former may develop in a child suffering from rickets. Neither has any relation to congenital lues.

Circumscribed Densification of Bone and Albert's Pelvic Spots. The investigations of Stieda⁷ are of great interest from the standpoint of diagnosis from the Röntgen negative. In his systematic *x*-ray studies of the various bones he has found dark spots in many places; as a rule

¹ Deutsche. Ztschr. f. Chir., 1905, vol. lxxvii, p. 284.

² Revue de Chir., 1905, xxv, p. 771.

³ Centralbl. f. d. Grenzgeb. d. Med. u. Chir., 1906, vol. ix, p. 322.

⁴ Mittheilungen a. d. Grenzgeb. d. Med. u. Chir., 1905, vol. xiv, p. 340.

⁵ Centralbl. f. Chir., 1905, vol. xxxii, p. 537; original in Practitioner, December, 1904.

⁶ Centralbl. f. Chir., 1905, vol. xxxii, p. 309.

⁷ Beit. z. klin. Chir., 1905, vol. xlv, pp. 700 and 704.

in each bone the spot is pretty constant. There is one in the centre of the condyle of the lower end of the femur, another in the acromial process, the lower end of the radius, the cuboidal bone, and the os calcis.

I found these spots, first, in patients *x*-rayed for various diseases. The area had apparently nothing to do with the disease in question. Carrying his study to the bones of the cadaver, he again encountered the spots, and when the bone was sawed it could be demonstrated that the spot in the *x*-rays was due to an area of eburnation of the bone. He demonstrated that the so-called Albert's pelvic spots are due to the same areas of densification. These Albert pelvic spots have been frequently observed by the radiographer in the pelvis, and in the early days were confused with the shadow thrown by a renal calculus.

In my experience with *x*-rays these spots will never lead to an error in diagnosis. Bone diseases with which we are chiefly interested are associated with bone destruction. The new bone formations are beneath the periosteum. This work of Stieda, however, should be borne in mind in the critical study of an *x*-ray negative.

Syphilis of Bone. Tuberculosis usually affects the epiphyses of the long pipe bones and invades the joints. It is unusual to find bone tuberculosis without joint symptoms. For this reason the diagnosis of tuberculosis of the joint is usually made, although, without much doubt, in the majority of cases the epiphysis is the primary focus. Tuberculosis also rarely extends up the diaphysis, and tuberculosis of the shaft of the long pipe bones is unique. On the other hand, pyogenic osteomyelitis, although it at first affects the epiphysis, always extends to the diaphysis, and, except in very young children, the joint is seldom invaded. Both tuberculous and pyogenic primary periostitis are rare. Syphilis has a predilection for the periosteum. Periosteal gumma and ossifying periostitis are very common lesions in lues. Therefore, Landau's¹ communication on the pathology and surgery of osteomyelitis gummosa of the long pipe bones is of great interest. The gumma may be present both in congenital and acquired syphilis. Chiari found its presence not infrequent, while Virchow stated that he had never seen an authentic case. In the literature Landau was able to find but few references, but there is sufficient to demonstrate that syphilitic osteomyelitis, with and without gumma formation, is possible. The lesions are usually multiple, and with rare exceptions the periosteum is affected and there is hyperostosis. Landau's cases are reported with great detail and minute gross and microscopic studies. Unfortunately he gives no *x*-ray pictures. In those cases in which there is ossifying periostitis the diagnosis should not be difficult, but when the medullary cavity

¹ Deutsch. Ztschr. f. Chir., 1905, vol. lxxix, p. 508.

only is involved, I am quite confident that a positive diagnosis could not be made unless the lesion was multiple. According to Landau pain is an indication for operative treatment. The partial removal of the affected tissue relieves the pain and hastens healing. In old cases the best results are obtained by a combination of surgery and specific treatment. These medullary gummata do not often suppurate, unless they are secondarily infected with pyogenic organisms, which was observed in one of Landau's cases.

In my own experience, I have seen syphilitic osteomyelitis on two occasions. One case was a child aged seven, in whom the gumma was in the lower end of the radius; on the same day the mother was operated on for a gumma in the sternocleidomastoid muscle. The second, more recent, observation was in a colored man: there was gumma of the testicle, and the right tibia was very much enlarged owing to ossifying periostitis. In the medullary tissue of the tibia I found two areas which had the gross and microscopic appearance of syphilitic granulation tissue.

Syphilitic periostitis with bone formation is a very frequent lesion, and the tibia is most commonly involved. The French call it *tibia en lame de sabre*. In a case reported by Finckh,¹ the patient was a female aged twenty-four; the evidence of congenital lues began at ten years of age. The *x*-rays show the curvatures, the irregular periosteal new bone formation, and, without much doubt, there is evidence of endosteal bone formation. The condition might be called osteitis deformans syphilitica, and when confined to a single tibia might be difficult to differentiate from Paget's disease. These peculiar bone formations are present in both acquired and congenital lues. When congenital, it is a late manifestation, usually at the end of the period of growth. Similar cases are reported by Harry Moses.² In this case double osteotomy was performed with a good result.

BONE TUMORS.

This subject is one of great interest and of immense practical importance. True, the relative number of cases is small, but the responsibility is proportionately greater. The early recognition of a periosteal or medullary neoplasm is frequently difficult, often impossible. Three methods for exact diagnosis should never be neglected—the *x*-rays, the tuberculin test, and the examination for Bence-Jones bodies in the urine. It should never be forgotten that a concealed primary neoplasm may first manifest itself as a single bone tumor of metastatic origin. The small adeno-

¹ Beit. zur klin. Chir., 1904, vol. xlv, p. 709.

² Ibid., p. 718.

carcinoma in the thyroid or prostate or even malignant tumors of the breast have been overlooked. More frequently the tumor in the kidney, especially the hypernephroma, has given no clinical symptoms, no hematuria, and careful abdominal palpation has failed to find the growth of the upper pole.

Bone tumors first call the attention of the host to their presence by local pain, impaired joint function, early fatigue of the limb, or a fracture from a slight trauma. When the physician is consulted for any symptom suggesting a lesion of the bone, the three diagnostic aids mentioned above should never be neglected.

Classification of Bone Tumors. The primary neoplasms are all of connective-tissue origin, benign and malignant. The relative virulence of the malignant tumors, both as to local growths and metastasis, varies within wide limits. In the treatment of these tumors this fact must be borne in mind, and the extent of the operation varies with the relative malignancy and the extent of the local growth. The operative interference may be simple curettement, excision of the tumor without destroying the continuity of the bone, resection of tumor and bone, low amputation, amputation at the highest joint, and, in some cases of sarcoma of the upper extremity, exarticulation with the scapula.

Beginning in *PROGRESSIVE MEDICINE*, December, 1899, this subject of the relative malignancy and the justification of more conservative operations in properly selected cases has been carefully considered with the most important literature. I am disappointed that so few communications are to be found in American literature.

The benign tumors of periosteal or medullary origin are not frequent. The benign bone cyst represents the most common innocent tumor arising in the medullary cavity, and the exostosis that from the periosteum. The fibroma is very seldom observed, except in connection with the upper and lower jaw. Myxomata so frequently show areas of sarcoma that they should be considered in the malignant group. Osteoperiosteal lipomata are unique.

The malignant connective-tissue tumors arising from the periosteum or medullary cavity differ from sarcoma of the soft parts only in their relation to the associated bone formation or destruction. In medullary sarcoma new bone formation, if present at all, is so scanty that it need not be considered. Bone destruction by actual infiltration of the tumor tissue or atrophy from expansion pressure is always present. In periosteal sarcoma the amount of new periosteal bone within the tumor tissue is an index to its malignancy—the greater the amount of bone formation the less malignant the tumor. The giant-cell sarcoma is so rarely observed, except in connection with bone, that it may be looked upon as a specific bone tumor. In other respects the sarcoma of bone may be classi-

fied, in a way similar to sarcoma of the soft parts, into simple sarcoma and angiosarcoma. The latter may be endothelial or perithelial in origin, according as the cells arise from the endothelium of vessels or the cells in the outer coat. These tumors may be of lymphatic or bloodvessel origin; mixed varieties are not infrequent. The relative malignancy of endothelial and perithelial angiosarcoma is very great. I have never observed a permanent cure. The simple sarcoma may be round celled, spindle celled, mixed spindle and round celled, spindle cells mixed with fibroblasts, or spindle cells, fibroblasts, and fibrous tissue. The latter tumor may be called a fibrosarcoma. The relative malignancy in simple sarcoma varies with the character of the cells. The more we see the spindle cell show a tendency to produce fibroblasts and fibrous tissue the less malignant the tumor. These simple sarcomata may be mixed with cartilage and myxomatous tissue—chondromyxosarcoma. Although they show a tendency to large local growth, marked destruction of bone, and even infiltration of muscle, they are usually cured if completely removed. When conservative operations are improperly employed in this variety of sarcoma and all the tumor is not removed the so-called recurrent growth is more cellular and may give rise to metastasis.

Diagnosis of Bone Tumors. If the public are educated to seek the advice of the physician because of slight symptoms, and the physician is keen in his differential diagnosis, surgeons will be consulted much more frequently in that stage of the life of a bone tumor, when a clinical diagnosis even with the aid of the tuberculin test, the *x*-rays, and the urine examination will be impossible. I think I shall be able to prove this in the discussion of the different forms of tumors. The point that I wish to emphasize is that the correct differential diagnosis of the periosteal or medullary lesion must be made at the exploratory incision. Surgeons should educate themselves for this new requirement. It is not difficult, in the majority of cases, to identify the nature of the pathological process by its naked-eye appearance. It has been my experience that the gross appearance is just as characteristic and perhaps less difficult to recognize than a frozen section rapidly prepared. The importance of this faculty, acquired by training to differentiate pathological processes by their gross appearance, cannot be overestimated in practical surgery. I had the opportunity to present my views on this subject before the Buffalo Academy of Medicine this spring. The paper was published in the *Journal of the American Medical Association* in November, 1906.

Benign Bone Cysts. Glimm's¹ is the most recent addition to the literature discussed in previous numbers of *PROGRESSIVE MEDICINE*. He summarizes his communication somewhat as follows: Cyst formation

¹ Deutsch. Ztschr. f. Chir., 1905, vol. lxxx, p. 476

in the long pipe bones is a disease of youthful age; usually only one bone is involved; its characteristics are benign, and as to etiology the problem is yet unsettled in many cases. The original view of Virchow that the cyst is due to degeneration of a previous solid tumor (misplaced cartilage) cannot be confirmed in many of the recent observations. The present conception looks upon the cyst as the product of inflammation. In its early stage there is a new growth of fibrous tissue in the bone-marrow, associated with calcification of bone. Through processes of resorption cavity formation takes place which finally leads to a large cyst which in its growth expands the bone and uniformly reduces the thickness of the cortical layer.

According to Glimm the majority of benign single-bone cysts are of inflammatory origin, a few undoubtedly are due to the softening of a solid tumor, or island of cartilage, as first described by Virchow. In arthritis deformans cysts may form (Ziegler). Multiple cysts have been observed in osteomalacia, and a disease described by v. Recklinghausen and called osteitis fibrosa contains cavities that may be looked upon as cysts. All of these varieties I have mentioned in my previous discussions. Echinococcus cysts of bone, although unique, must be borne in mind, but they belong to a special group as to etiology. Glimm agrees with Helbing and myself in his interpretation of the *x*-rays of cases of supposed benign cysts. This picture cannot be differentiated from other possible medullary tumors which produce bone expansion and atrophy of the corticalis with bone absorption of the medullary cavity. The diagnosis, according to Glimm, can only be made with absolute certainty by the gross appearance of the tissue exposed at the exploratory incision.

One should never neglect, when the *x*-rays show a picture suggestive of a benign bone cyst, to study all the other bones of the body for the presence of other similar lesions.

Multiple tumors are observed in osteomalacia. Myeloma is a multiple primary lesion. A few cases of multiple giant-cell sarcoma have been described. Metastatic sarcoma or carcinoma may be multiple. In the presence of multiple lesions the treatment of the single lesion is modified. The presence of Bence-Jones bodies in the urine, although not absolutely pathognomonic of multiple myeloma, is a very suggestive symptom. I will discuss this point again under multiple myeloma.

The clinical picture and gross pathology of benign cysts have been so extensively described in the previous numbers of *PROGRESSIVE MEDICINE* that it is not necessary to take space here for repetition. The personal observations so far reported by me have been kept track of up to the present date, and the patients continue well.

In Lebert's *Atlas of Pathological Anatomy* there is a beautiful picture of a bone cyst (Plate 167) to which my attention was called by Dr. Park,

of Buffalo. The illustration is almost identical with a specimen belonging to Dr. Park in the Museum of Buffalo, a photograph of which was reproduced in *PROGRESSIVE MEDICINE*, December, 1905, p. 274, Figs. 38 and 39.

The case reported by Fleischhauer¹ is apparently of cartilage origin, and of interest because it was situated in the crest of the ilium and bilocular in character. The patient was a girl aged twenty years, and suffering with tuberculosis. At the exploratory incision the cyst contained clear fluid, and microscopically remains of cartilage were found in the wall.

One should be very careful, at the exploratory incision, to investigate the character of the wall of the cyst. Not all bone cysts are benign. Solid malignant tumors in the medullary cavity may be transformed into cysts owing to degeneration of the central portion of the tumor tissue. In April, 1905, some tissue (Pathol. No. 6326) was sent to the surgical pathological laboratory with the statement that it was curetted from the wall of a benign bone cyst in the lower end of the tibia. The tissue was friable, hemorrhagic, resembling the characteristic appearance of a giant-cell sarcoma. In my own experience and in the cases described in the literature no bone cyst has had this lining. A gross diagnosis of giant-cell sarcoma was made, which was later confirmed by the microscope. The section of this tissue differed somewhat from the cases of giant-cell sarcoma with which I was familiar—there were more round and spindle cells and more fibrous tissue. I looked upon the tumor at that time as a giant-cell sarcoma and the cyst as due to hemorrhage; upon the more cellular areas as the product of inflammatory changes of the medullary tissue into which the giant-cell tumor was infiltrating. The surgeon in this case as he considered the tumor a benign bone cyst had not, of course, attempted to remove all of the wall, which is unnecessary in the benign cyst. The clinical history suggested the diagnosis of a benign cyst, except the age of the patient, which was thirty-five. However, the age of onset was ten years. For twenty-five years there had been pain and swelling of the left ankle, which, however, had not been severe enough to cause much inconvenience. Ten years ago the condition had been diagnosed chronic arthritis. During the last six weeks the pain had become so intense and the swelling had so increased that he sought surgical advice. There was a uniform expansion of the lower end of the tibia, no restriction of motion in the ankle, and the *x*-rays showed a medullary tumor. At the exploratory incision there was a bone shell, a cavity containing blood, but the bone shell was lined, not by the connective-tissue membrane characteristic of a benign cyst, but a friable, hemorrhagic granulation

¹ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 988

tissue. The cavity after operation filled rapidly with edematous granulation tissue of a character which one would not expect in a healthy bone cavity, but of the appearance almost positive of a new-growth. At the second operation, two months later, the tumor filling the lower end of the tibia had broken through the bone shell and so infiltrated the soft parts that an amputation was done. This patient died of general metastasis about fourteen months after the first operation. Whether the metastasis was due to the partial curetting of the first operation is impossible to say.

Pure Myxoma of Bone. I have never observed an example of this unique tumor of which Soubeyran,¹ in reporting his single observation, mentions but six cases in the literature, present in the medullary cavity of the long pipe bones or of subperiosteal origin. The tumor is more common in the upper and lower jaw. In the long pipe bones the medullary myxoma, as it produces a bone capsule in its growth, cannot be differentiated clinically from the bone cyst, giant-cell sarcoma, or a multiple myeloma presenting itself clinically as a single primary tumor. The diagnosis, according to this authority, must be made at the exploratory incision. Codman's² case might be looked upon as a pure myxoma of the middle phalanx of the hand. At that time the solid tumor was viewed as the early stage of a cyst, and diagnosed, from its gross appearance, as a myxochondroma.

The subperiosteal tumor in its growth produces a cup of depression in the shaft of the bone. The differential diagnosis in this variety will probably be less difficult, but one could not exclude a periosteal sarcoma. The case reported by Soubeyran is of sufficient interest and practical importance to discuss in detail. Unfortunately there is no x-ray study. The individual was a female, aged twenty-four years, who observed a blue spot in the skin over the inner surface of the lower third of the tibia for years. Very quickly she observed swelling at this spot; there was no pain or tenderness, no history of trauma. The growth was very gradual. At the examination the swelling was evident on inspection; it was an oblong mass, 8 cm. by 2 cm.; its greater diameter corresponded with the longitudinal diameter of the tibia. The skin over the tumor had a bluish appearance. On palpation the skin was not adherent to the tumor, but the latter was fixed to the shaft of the tibia. The surface of the mass was soft and fluctuated; its periphery adjacent to the shaft of the tibia was composed of a capsule in which one could make out pieces of bone. A clinical diagnosis of periostitis aluminosa was made. At the exploratory incision the skin was normal, the periosteum a little

¹ *Revue de Chir.*, 1904, vol. xxix, p. 239.

² *PROGRESSIVE MEDICINE*, December, 1904, p. 185.

thickened; when it was divided there exuded a gelatinous material. The cavity had a periosteal wall everywhere, and a thin shell of bone in places. The lower portion of the cavity was situated in a defect in the outer table of the shaft of the tibia, lined by bony tissue in which the lamellæ of bone were separated by this gelatinous tissue; beyond this the bone of the shaft became compact, changed from normal only in the fact that it appeared more hemorrhagic. The disease did not infiltrate the marrow cavity. The treatment consisted of curettement. That this operative removal was not sufficiently extensive is indicated by the rapid recurrence two months later. At the second operation, in July, 1903, the pathological anatomy of the tumor was identical with the first tumor excised. The operation was more radical in that a zone of apparently normal bone was removed with the chisel. At both operations the periosteal capsule was excised. The recurrence was undoubtedly due to the incomplete removal of osseous tissue beyond the defect in the shaft of the tibia, as in these myxomata there is no definite line of demarcation. There had been no further recurrence at the time of the publication of the article, about May, 1904, one year after the operation.

This communication stands alone in recent literature on pure myxoma of bone and can be consulted for our knowledge of this interesting and rare bone lesion up to date. In the discussion of the treatment Soubeyran advocates the conservative measures which I have discussed in the treatment of giant-cell sarcoma. This tumor should never be treated like a benign bone cyst.

Soubeyran's case is an example of a periosteal myxoma.

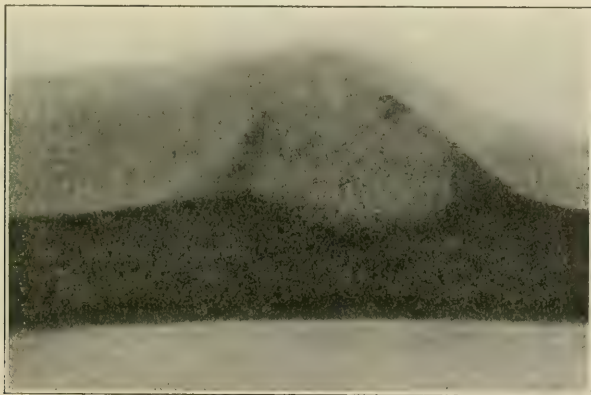
MIXED FORMS OF MYXOMA AND MYXOSARCOMA. It is unnecessary to go into a discussion whether pure myxoma arises from congenital areas of cartilage or whether they are the product of the connective tissue present subperiosteally or in the Haversian system of bone. Both sources seem possible. Practically, these tumors are usually mixed myxochondroma, and exhibit a strong tendency to become sarcoma. The myxoma, no matter where it arises, shows this tendency to malignant degeneration. I have discussed this tumor in previous numbers of *PROGRESSIVE MEDICINE*.

A recent observation of a periosteal myxochondrosarcoma of the shaft of the humerus, by Dr. Halsted, may be compared with Soubeyran's case.

Pathol. No. 6773. This patient, a female, aged fifty-three years, had noticed a tender spot in the region of the present tumor for twenty years. The tumor had been felt but nine months. Nothing could be seen on inspection, but on palpation in the area of the insertion of the deltoid on the shaft of the humerus a circumscribed mass fixed to the shaft of the bone could be made out. The top was soft, the periphery hard; the

x-rays (Fig. 19) need no description. The evidence in favor of a benign periosteal lesion is the shadow of the bone beyond the cup-depression formed by the tumor, and the suggestion of bone in the capsule. In a true cartilaginous exostosis I have never observed any destruction of the shaft beneath. This depression, therefore, indicated a lesion producing bone destruction, but as the bone was destroyed uniformly and showed no evidence of infiltration, one could feel justified in the conclusion that we were dealing with a benign tumor, or a sarcoma of a low grade of malignancy. At the operation by Dr. Halsted the surrounding deltoid muscle was edematous; the tumor had a distinct capsule which, toward the shaft of the bone, contained spicules of bone; within the capsule the tumor did not contain the gelatinous fluid of Soubeyran's case, but was solid; there were some areas like cartilage, others softer, like myxomatous tissue, and still others of a granular, cellular appearance suggesting a

FIG. 19



myxosarcoma; the demarcation between this growth and the surface of the bony capsule of the shaft was distinct and did not show the infiltration present in Soubeyran's case.

In addition to removing the tumor with a zone of muscle the shaft of the humerus was chiselled for at least 0.5 cm. to 1 cm. beyond the depression.

The tissues in this case which I have studied microscopically show cartilage and myxoma, and areas of spindle and round cells; the muscle beyond the capsule shows myositis, and, at one point, slight infiltration of the tumor. At the present time, one year since the operation, there is no evidence of recurrence.

Space forbids much further discussion of this very interesting group of mixed tumors, which can be looked upon as myxochondroma or myxochondrosarcoma. As the true benign type is so infrequent, it would be

wiser in practical surgery to consider all tumors which contain cartilage and myxomatous tissue as malignant, but it must be borne in mind that the chief danger in this particular neoplasm is local recurrence rather than internal metastasis. Therefore, in the operative plan one should give the apparently innocent myxomatous and cartilaginous structures a wide birth. Amputation, however, or resection of bone in continuity are only indicated by the extent of local infiltration.

In studying the ultimate results of large groups of sarcoma of bone we can divide them into three great classes: first, those patients who die very quickly of internal metastasis irrespective of the extent of the operative removal. The angiosarcoma, especially the perithelial, and the mixed spindle-cell and round-cell sarcoma belong to this group. The permanently cured cases are chiefly the giant-cell sarcoma, the ossifying periosteal sarcoma, and the fibrosarcoma. In this group one also finds the myxochondrosarcoma. In the third group there is local recurrence. The operation as a rule has followed conservative lines. The majority of cases found here are myxochondrosarcoma. Not infrequently after one or two operations for recurrence the patients have remained permanently well, but there is great danger of metastasis from the recurrent tumor which changes in its character losing the type of a myxochondroma and becoming a cellular sarcoma. A careful pathologic-anatomical study explains the greater probabilities of local recurrence in myxocartilaginous tumors, because, for some unexplained reason, they seldom retain the circumscription of growth observed in the giant-cell tumor, the ossifying periosteal neoplasm, or the fibrosarcoma.

These facts must be borne in mind in the conservative treatment of bone sarcoma.

A case of myxo-osteochondrosarcoma reported by Seitz¹ illustrates this point. The patient was a boy, aged seventeen years. The medullary tumor which had broken through the bone capsule and infiltrated the soft parts was removed by a local operation. There was recurrence and later death from internal metastasis.

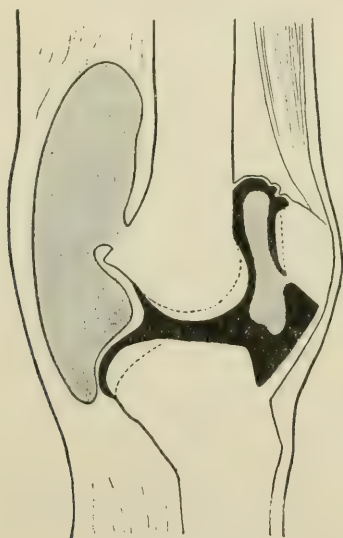
Osteoperiosteal Lipoma. Lipoma, even more than dermoid cysts, may be expected almost everywhere. Quite frequently a clinical diagnosis is impossible. It is one of the amusing incidents of surgical diagnosis to study with the greatest care a tumor, considering the possibilities, usually excluding the innocent lipoma, and then, at the exploratory incision, to find to the chagrin of your surgical sense, yet pleasantly disappointed on account of the welfare of the patient—fatty tissue. On two occasions patients had been sent to me from considerable distances with tumors in the popliteal space; their anxiety was intense because of the informa-

¹ *Deutsch. Ztschr. f. Chir.*, 1905, vol. lxxviii, p. 601.

tion that the swellings were probably of a malignant nature and amputation an eventuality. The tumors proved to be lipoma and were removed under cocaine anesthesia. A very interesting tumor, in a child of fifteen years, situated in the lumbar area, excited the greatest interest in Dr. Halsted's clinic as to its probable nature. It is my recollection that lipoma was not considered, yet the tumor proved to be an osteoperiosteal lipoma with attachments to the vertebral column, and not at all difficult to remove.

The first contribution with which I am familiar is a recent one by Schwarz and Chevrier,¹ who in reporting their observations give a complete *resume* of the literature. The lobulated tumor in the region of the

FIG. 20



left knee had been present nineteen years in a male, aged twenty-nine years, and had given no discomfort, nor restricted function at the knee; the skin was normal and movable, the tumor firm, elastic, and lobular. The *x*-rays showed a slight exostosis on the posterior surface of the lower end of the femur, to which, at the operation, the lipomatous tissue was found attached. This attachment is shown in the diagram (Fig. 20), and also an intra-articular lipomatous mass attached to the patella. There was no difficulty in removing the adipose tumor without injury to the function of the joint.

Joint lipomata I have previously discussed.²

¹ *Revue de Chir.*, 1906, vol. xxxiii, p. 469.

² *PROGRESSIVE MEDICINE*, December, 1899, p. 213; and December, 1900, p. 205.

Schwarz and Chevrier consider the lipomata of periosteal origin, in which quite frequently there is an exostosis beneath the attachment. These tumors may arise from the shaft or epiphysis of the long bones or the vertebrae or the bones of the skull. Some undoubtedly are congenital in origin, others acquired. The etiology is obscure. The authors have been able to collect some fifty cases. They do not include the lipoma situated within the cranial cavity or spinal canal, the chief interest of which, of course, is their relation to pressure symptoms. The periosteal lipomata are the most frequent, the osteoperiosteal variety in which the adipose tissue extends into the bone is very rare, and the intraosseous lipoma is unique. The tumors may be single or multiple, encapsulated or diffuse; some reach great size.

In the differential diagnosis of a new-growth the possibility of a lipoma should be always borne in mind.

In the attitude of a surgeon toward a new-growth in which many possibilities must be considered from the clinical picture, the suggestions of Stimpson¹ are very appropriate. In this address on "Self-restraint in the Practice of Surgery," he cautions the younger generation that one should always bear in mind that in the art of surgery one should do no harm. In the treatment of a tumor, if the surgeon is carried away by the thought only of malignant possibilities, and their extensive removal, harm will be done to many patients suffering from an innocent tumor or one of a relatively low grade of malignancy.

Multiple Giant-cell Sarcoma. Space forbids a detailed consideration of this rare possibility, but I have mentioned before that in the differential diagnosis of an apparently single-bone lesion the possibility of multiple lesions, present but not manifest, of primary or metastatic origin should always be considered. X-ray studies of other bones should be made and the urine examined for Bence-Jones bodies. Rehn's² published case represents the best histological study and his illustrations are the first to appear in the literature. Rehn considers his case one of ostitis deformans with the formation of multiple tumors, each of primary origin. Many, especially the hemorrhagic tumors, are giant-cell sarcomata. As we have discussed under Diseases of Bone, there is a definite relation between ostitis deformans, osteomalacia, and osteitis fibrosa. We have mentioned the possibility of cysts in osteomalacia, and Rehn's case is an example of multiple giant-cell tumors in a girl, aged twenty-three years, in which the disease lasted many years before death.

The case observed by Crile and Hill, in Cleveland,³ represents one with the most complete x-ray study. The Röntgen pictures differ very little

¹ Amer. Jour. Med. Sci., June, 1906, vol. cxxxi, p. 939.

² Archiv. f. klin. Chir., 1904, vol. lxxiv, p. 426.

³ Surgery, Gynecology, and Obstetrics, July, 1906, vol. iii, No. 1, p. 57.

from those of Heineke's case of multiple cysts in osteomalacia,¹ or those taken in Goldthwait's case of osteomalacia, prints of which Dr. Goldthwait sent me some two years ago.

Giant-cell Sarcoma. Gwilym G. Davis² records a case of medullary giant-cell sarcoma of the lower end of the ulna in which he removed the tumor by curretting. In a letter from Dr. Davis, dated July 28, 1906, he informs me that it is now two years and seven months since the operation and that his patient is well; there are no signs of recurrence and no evidence of tumors elsewhere in the body. The observation is of additional interest, because the patient was but three and a half years of age at the time of the operation, and the tumor was situated in the medullary cavity of the lower end of the ulna; pain and swelling in the region of the wrist had been present about four months. The *x*-ray picture was interpreted as a cyst; on palpation the swelling was found to be entirely due to distention of the lower end of the ulna; there was no edema or change in the soft parts; the operation was not performed until nine months after the onset of the disease; the exploratory incision revealed a normal periosteum and a thin shell of bone; the distended medullary cavity was filled with a soft reddish granulation tissue; there was no evidence of cartilage; one small cavity in this tissue contained about 5 c.c. of thin brown fluid; there was no lining membrane of the bone shell. This tissue was removed with the curette, and the wound allowed to heal by granulation. A microscopic examination, which is illustrated in Davis's communication, shows a giant-cell sarcoma.

William J. Taylor, of Philadelphia (Pathol. No. 7440), has sent me tissues from a giant-cell sarcoma which he removed with a curette from the lower end of the femur (medullary cavity). I shall report this case in detail in the next *PROGRESSIVE MEDICINE*. The *x*-rays in Davis' case are further evidence that it is impossible to differentiate clinically or from the Röntgen plate those cystic and medullary tumors which, in their growth, expand the bone and are surrounded by a bony shell.

In December, 1906, it will be four years since I have removed with the curette a giant-cell sarcoma in the medullary cavity of the upper end of the tibia (Pathol. No. 4520³). This patient was exhibited before the Clinical Society of Surgery in April of this year; the bone cavity was almost completely lined with epidermis, there was no restriction of function to the knee-joint and no weakness of the limb. When this case was first published⁴ I added a collection and short summary of all the cases of giant-cell sarcoma of the long pipe bones observed in Dr. Halsted's

¹ *PROGRESSIVE MEDICINE*, December, 1904, p. 187.

² Univ. of Penna. Med. Bull., November, 1905, vol. xviii, p. 249.

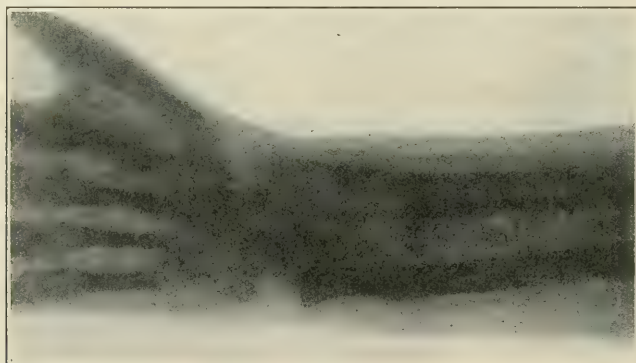
³ *PROGRESSIVE MEDICINE*, 1903, p. 201.

⁴ Johns Hopkins Hospital Bulletin, May, 1903, vol. xiv.

clinic since the opening of the hospital in June, 1889. These cases have been kept track of up to the present time, and no recurrences have been observed. There were seven patients: in three the tumor was periosteal, in four medullary. Since this publication the number of giant-cell sarcomata observed in Dr. Halsted's clinic have been relatively few. In February, 1905, Dr. Halsted resected a giant-cell sarcoma situated in the lower end of the radius (Pathol. No. 6125). This case has been reported with illustrations.¹ Resection was performed rather than curetting, because the tumor had broken through the shell of bone in places and infiltrated the surrounding soft parts. At the present writing (August, 1906), eighteen months since operation, there is no recurrence and fair function of the arm.

At the same time I mentioned a second observation in which the tumor was situated at the lower end of the tibia (Pathol. No. 6326). In this

FIG. 21



case a clinical and operative diagnosis of benign bone cyst was made. I have discussed this case again this year under "Benign Bone Cysts." There was local recurrence and at the second operation amputation was necessary; the patient died of metastasis. This is the first observation that I found of metastasis in a giant-cell sarcoma.

Homer E. Safford, of Detroit, has sent me his *x*-rays and some tissue from a giant-cell sarcoma of the lower end of the radius (Pathol. No. 5601). In this case amputation of the humerus was performed in November, 1899. At the present time, six years and eight months since operation, the patient is well. The lower end of the humerus is apparently a common situation for this form of tumor. In Dr. Halsted's clinic four cases were observed, in all of them there was a history of traumatism, in one a definite Colles' fracture. Safford's patient, a woman, aged

¹ PROGRESSIVE MEDICINE, December, 1905, p. 277.

fifty-two years, gave a history of traumatism, perhaps Colles' fracture, four years previously, then a second traumatism followed by the appearance of the tumor in ten months. The *x*-ray photograph is reproduced in Fig. 21. I believe, in this case, the tumor could have been removed by curetting or resection with just as positive assurance of an ultimate cure.

Karewski,¹ in discussing the conservative treatment of bone tumors and reporting some cases, describes a giant-cell sarcoma apparently of periosteal origin, situated on and invading the head of the tibia. The tumor was excised with the surrounding soft parts and bone, leaving the outer border of the shaft of the tibia, that is, the continuity of the shaft of the tibia was not destroyed, and new periosteal bone formation partly filled the defect. The function of the limb and joint was not impaired, and there was no recurrence eighteen months after operation.

Periosteal giant-cell sarcoma in the region of the tubercle of the head of the tibia is of comparative frequency. I have observed two cases in this position, both remained well since operation. In one the tumor was removed by resection, in the other the leg was unnecessarily amputated.

Giant Cells. The most interesting and complete monograph on these remarkable cell forms has recently appeared by Babes.² The original, which I obtained from the Surgeon-General's Library in Washington, is a large folio of 126 pages and 10 colored plates. The literature is discussed and all the known forms of giant cells which may be roughly classified under the following headings: Hodgkin's disease, foreign bodies, tuberculosis, anthrax, leprosy, tumors from muscle degeneration, and of epithelial origin. He concludes that giant cells originate in vessel sprouts, a conclusion which apparently agrees with that of Friedländer.³

Multiple Myeloma. A recent observation of my own has demonstrated the importance of *x*-ray studies of many bones of the skeleton and an examination of the urine for Bence-Jones bodies in all cases of bone tumors which clinically appear as single lesions. This patient, an adult male, had received a traumatism to the right shoulder, following which there was pain and tenderness. Seeking medical advice he was told to employ massage and passive motion. Swelling in the region of the outer third of the clavicle was not observed by the patient until thirteen months after the injury. The *x*-rays demonstrated a uniform expansion of the medullary cavity of the outer third of the clavicle in which a very thin shell of bone was preserved—a picture, therefore, of a medullary tumor resembling a bone cyst or a giant-cell sarcoma. Before the operation the urine was not examined for the characteristic substance, nor were other *x*-rays

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 920.

² Bibliotheka Medica, 1905.

³ PROGRESSIVE MEDICINE, December, 1905, p. 279.

made. In view of the rapid growth and the very thin bone shell, complete resection was considered the wiser operation. After the tumor was removed and cut into, it was not a cyst, nor had it the appearance of a giant-cell sarcoma. The bone capsule was filled with a whitish, mucoid, soft growth, in a few places slightly hemorrhagic—the appearance, therefore, of a cellular sarcoma. The frozen sections had the appearance of a round-cell sarcoma and contained cells characteristic of a myeloma. More carefully prepared sections demonstrated the presence of a cellular picture corresponding with reported cases of multiple myeloma. After operation the examination of the urine found a large quantity of the Bence-Jones albumosis. A number of *x*-ray studies were made of the bones of the skeleton, but not until some two months after operation did the Röntgen picture show a second bone focus. This was found in one of the ribs. Stimulated by this observation, I made a very careful study of the literature which at the present time is by no means finished, nor am I prepared to answer positively the questions which interest me most: First, as far as I have gone, I have been unable to find a second observation in which a patient suffering with multiple myeloma presented the clinical picture, when first observed, of a primary single-bone focus with absolutely no other general symptoms. As regards the first question, one may say that it is possible for multiple myeloma to present the obscure clinical picture observed in this case. Second, is the presence of the Bence-Jones bodies in the urine pathognomonic of multiple myeloma? This substance is not always found in the urine in multiple myeloma. Some of the negative observations may be due to faulty technique. It has been observed in other grave lesions of the marrow tissue. In some of the more recent communications it is stated that this substance has been found in the urine in a few cases of single medullary sarcomata. At the present time I have been unable to trace these cases to the original communications.

The prognosis in multiple myeloma is hopeless, although the patient may live a number of years.

In the presence of a single-bone focus in which the clinical picture and *x*-rays demonstrate a medullary tumor and in which the Bence-Jones bodies are found in the urine, I believe one is justified in removing this focus. The probabilities, however, favor the development of other foci and a clinical picture of multiple myeloma. I do not believe, however, such a patient should be mutilated by the amputation of a limb. The two more recent articles, with the discussion of the literature which I have read, are by Jellinek¹ and von Verebely.²

Multiple myeloma is apparently a general disease in which there are

¹ Virchow's Archiv, vol. clxxvii, p. 96.

² Beiträge zur klin. Chir., 1906, vol. xlviii, p. 614.

specific changes in the cells of the bone-marrow which lead to the formation of multiple bone tumors and bone defects, a disease somewhat akin to leukemia and Hodgkin's disease. As a rule the bones are softened; bending of the vertebral column and pelvis lead to deformities, and the bending of the long pipe bones to spontaneous fractures. The clinical picture of the disease, especially in its onset, varies and diagnosis may be difficult. When fully developed the recognition is easy. The possibility of abstracting from the medullary tumors some specific serum for therapeutic purposes has been considered and should be tried. For microscopic illustrations see MacCallum's article.¹

Periosteal Osteosarcoma and Exostosis. The subject of periosteal growths in which there is new bone formation is one of great interest and practical importance. As one's experience increases, and with the aid of the *x*-rays, more observations of periosteal lesions come to our notice, and the subject is referred to from time to time in the literature. In the recent German Surgical Congress, Fritz König discussed this subject under the title "Traumatic Osteoma." From a practical standpoint we must divide the cases into two great groups. First, the true osteosarcoma. I believe the term osteosarcoma should be confined to that variety of bone tumors in which bone formation accompanies the new-growth of sarcomatous tissue. Unfortunately, in English literature, osteosarcoma is employed for any variety of sarcoma of bone. The true osteosarcoma is always of periosteal origin and of a relatively low grade of malignancy. In *PROGRESSIVE MEDICINE*, December, 1902, p. 158, when I discussed forty cases of sarcoma of bone observed in the surgical clinic of the Johns Hopkins Hospital, I mentioned three observations of periosteal osteosarcoma; one involving the upper half of the shaft of the humerus which remained well ten years after a shoulder-joint amputation; at the present time I am of the opinion that a less radical operation would have been sufficient. In a second case the ossifying sarcoma surrounded the shaft of the middle third of the fibula; here, also, unfortunately, amputation was performed. I was able to demonstrate in the laboratory on the specimen that the tumor could have been completely excised without injury to the shaft of the tibia or the important vessels of the leg. This patient is well, now almost four years since operation. In the third case the ossifying sarcoma involved the ribs and chest wall and was inoperable on account of this situation. During the same period four cases of ossifying periosteal sarcoma of the lower jaw were subjected to complete resection. All of these patients have remained well and free from recurrence, from three to ten years since operation. These observations are confirmed by published reports of other large surgical clinics.

¹ *Journal of Experimental Medicine*, 1901, vol. vi, p. 53.

One can recognize the periosteal osteosarcoma from the benign osteoma, exostosis, or traumatic or luetic ossifying periostitis by the *x*-ray picture. Bone formation is comparatively scanty as compared with that in the benign lesions, and the shadows of the new bone appear radiating perpendicular to the shaft. In this variety of tumor the entire disease must be removed.

The benign exostosis and the traumatic and luetic ossifying periostitis require no operative treatment or a very conservative one. Traumatic exostoses have been considered.¹ At that time I also reported, with a colored illustration, a beautiful example of *exostosis bursata*, which lesion must be considered in the differential diagnosis.

Dalla Vedova² gives a very interesting study of four cases of exostosis bursata, and concludes that these new formations have no relation to the synovial membrane of joints and the articular cartilage, and that they do not arise from joints. He is of the opinion that they are originally exostoses of bone, osseous or cartilaginous in origin, and the cavity or bursa formation is due to the liquefaction of cartilage.

Cartilage and bone exostoses are frequently multiple. Lenormant³ calls attention to the frequent occurrence of impaired growth of the bones when these exostoses are present. He concludes that the multiple exostoses are not the cause of this impairment of growth, but are part of a general disease characterized by faulty ossification, and that the disease has no relation to rickets.

An example of multiple chondro-osteoxostosis with impairment of the growth of bones has recently been observed in Dr. Halsted's clinic (Pathol. No. 6573). The patient, a boy, aged sixteen years, sought the advice of the clinic because of a tumor formation involving the left great toe which the patient attributed to a traumatism. He was not aware of the other exostoses, some of which could be palpated, other disclosed by the *x*-ray studies. The tumor which involved the second phalanx of the great toe was removed on account of the pain and its size. The new-growth was chiefly cancellous bone with a capsule of cartilage and fibrous tissue; as yet there was no bursa formation.

These cases of multiple osteomata or exostoses are not difficult to interpret. When the lesion, however, is single, they might, if not carefully studied, be mistaken for a malignant ossifying bone tumor. The interpretation of the *x*-rays might prove difficult to one not familiar with these lesions. I have an *x*-ray of an exostosis or an osteoma originating from the iliac crest. It had been observed by the patient, aged thirty years, about three months and was referred to me with

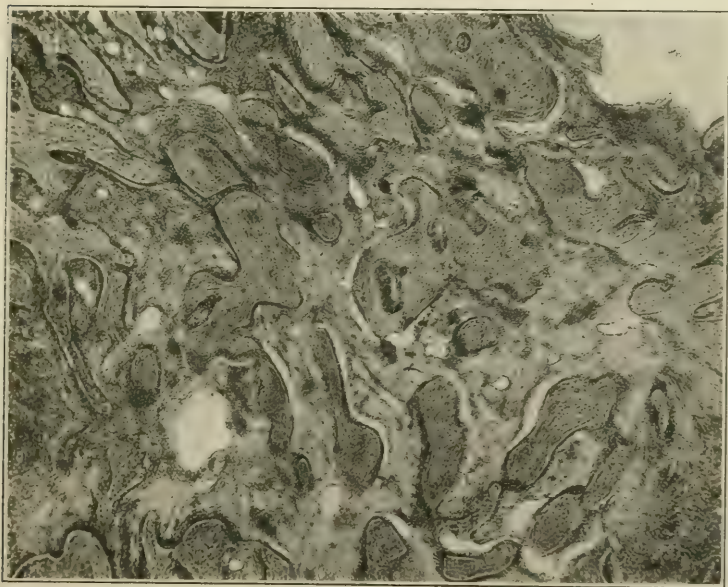
¹ PROGRESSIVE MEDICINE, December, 1903, p. 194.

² Policlinico, 1905; Centralbl. f. Chir., 1905, vol. xxxii, p. 506.

³ Centralbl. f. Chir., 1905, vol. xxxii, p. 1293.

a possible diagnosis of a malignant tumor. On palpation its bony hardness practically excluded an osteosarcoma, and this was confirmed by the *x*-rays. It is now two years since I saw this patient; there has been no further growth, and it gives no discomfort. When this bony growth was observed the patient was under treatment for lues. It appeared some eight months after the primary lesion; the only possible trauma was the constant friction of his belt. In this case I suggested, but did not urge operation. I advised the patient that if further observation demonstrated increased growth and discomfort, the tumor should be removed. As this has not happened, he preferred not to be operated upon. The only disability is due to the fact that he does not wear a belt on account of the discomfort, or perhaps the fear

FIG. 22



that it will excite further growth. Fig. 22 (Pathol. No. 6815) is a photomicrograph of a periosteal osteoma of the cancellous variety springing from the outer and lateral surface of the upper third of the shaft of the humerus. The patient was a female, aged forty years, and had observed the tumor four months. It was removed by Dr. Thomson, of Scranton. The clinical findings and situation resemble a case which I discussed, except that the histology of the tumor is different.

In Dr. Halsted's clinic there have been two interesting cases of exostoses springing from the shaft of the lower end of the femur. One was a colored girl, aged twelve years, who had observed the tumor three years;

the *x*-rays showed a definite bony growth, irregular in outline, springing from the shaft of the femur above the condyles; at the operation there was an irregular growth of cancellous bone covered with cartilage, and this covered with connective tissue in which there were small cysts; only part of the new-growth was removed. In the second case, that of a colored man, aged forty-one years, the lesion was of twelve years' duration; the *x*-rays and pathological findings were identical.

I will discuss this subject again under traumatic and luetic ossifying periostitis. From the scanty references in English literature and the absence of more than a mention of these lesions in the English text-books on surgery, I feel justified in occupying some space to call attention to periosteal formations which might be mistaken for osteosarcoma and in which unnecessarily extensive operations based upon an incorrect diagnosis might be performed.

The More Malignant Bone Tumors. The bone lesions which I have just described, with the exception of the multiple myeloma and multiple giant-cell sarcoma, are relatively benign, and if subjected to proper operative treatment, can as a rule be permanently cured, and with a mutilation only in proportion to the extent of the local growth. In the more malignant sarcoma of bone, periosteal and medullary, the tumors grow rapidly. The medullary growth is seldom surrounded by a shell of bone, but destroys bone irregularly, perforates, and forms a periosteal tumor, so that in some cases it is difficult to arrive at a conclusion whether the neoplasm is primary from the medullary cavity or not. Local pain without swelling is the symptom of onset, and there may be a pathological fracture before the patient observes any tumor formation. On the other hand, in the periosteal tumor the pain is more intense and tumor formation is usually very quickly observed. The new-growth eats its way irregularly into the shaft and may later reach the medullary cavity.

My own observations demonstrate that primary medullary tumors grow more rapidly, destroy bone, perforate to the surface and produce periosteal growths much more frequently and rapidly than the periosteal tumor. That is, the latter does not infiltrate into the medullary cavity as rapidly as the medullary tumor breaks through the shaft. Lennander's¹ observation on the sensitiveness of the tissues explains the early appearance and greater intensity of the pain in *periosteal growths*. This membrane is supplied with nerve branches of the cerebrospinal system, while the cancellous bone and medullary tissue is insensible. One can be suspicious of a very malignant bone tumor from the irregular destruction of bone tissue as shown in the Röntgen picture. Besley,² who reports

¹ Mittheilungen a. d. Grenzgeb. d. Med. u. Chir., 1902, vol. x; and 1906, vol. xv

² Surgery, Gynecology, and Obstetrics, November, 1905, vol. i, p. 412.

five cases of sarcoma of the long pipe bones, remarks that none of them are giant-cell sarcoma. At the time of his report four had died and one was of too recent date to judge of the ultimate result. The pathological study of his cases demonstrates that they all belong to the more malignant groups.

Crile and Howard,¹ of Cleveland, give a most interesting *resume* of their own observations and the literature on *endothelioma* and *perithelioma of bone*. They report four cases and collect nineteen. These tumors, differing from other forms of sarcoma, are rarely observed in children. Trauma is an infrequent etiological factor. The long pipe bones, similar to other forms of sarcoma, are chiefly affected. The tumor most frequently originates in the medullary cavity. Pain, tumor formation, and pathological fracture do not differ from other forms of medullary sarcoma. The tumor is more apt to be encapsulated; pulsation has been noted (pulsation is more common in giant cell sarcoma); metastasis is very frequent and early. There are no clinical or *x-ray* findings to allow a differential diagnosis from other forms of sarcoma. Unfortunately the ultimate results, the most interesting point, are not considered in detail. Crile writes: "The prognosis may be stated as favorable in cases in which an operative treatment can be safely instituted." The exact number of cured cases is not stated. All of their personally observed cases died of metastasis. Among the nineteen cases collected from literature, in not a single one was the ultimate result, some time after the operation, noted; in only a few did the patients leave the hospital; many were autopsy cases. Pahn's observation of multiple endothelioma originally reported as a multiple myeloma is included in their list of cases. We have, therefore, from this careful study, not a single cured case. This corresponds to my own experience. I have observed three cases of medullary perithelioma of bone; all of the patients died of metastasis: two within one year, the third patient lived three years. I have never observed an endothelioma of bone, but recent experience with endothelioma of other tissues has taught me that the duration of life in this variety of tumor in some instances is longer than in others—two to three years. At the present time I am unable to find a cured case. Zeit,² of Chicago, contributes a most interesting article on *endothelial tumors*, but reports no cases observed to arise from bone. I will consider this article again under Sarcoma of the Skin and Soft Parts. Ritter³ in reporting a case of *perithelioma of the shaft of the tibia* is interested chiefly in the cellular pathology and the explanation of the presence of fat found in his tumor. From the clinical picture and the *x-rays* in

¹ Annals of Surgery, September, 1905, vol. xlii, p. 358.

² Jour. Amer. Med. Assoc., February 24, 1906, vol. xlvii, p. 567.

³ Deutsch. Ztschr. f. Chir., 1899, vol. 1, p. 348.

this case one could have been quite certain that it was one of the more malignant forms of bone tumors. The ultimate result after amputation of the knee-joint is not stated.

After a most careful investigation of the cases of *sarcoma of bone* reported in the literature, made for me by Mr. Schapiro, we find recorded but three cases of the more malignant varieties of bone sarcoma which may be considered cured. Kramer¹ in reporting a number of cases mentions one (Case 3) which remained well four years after operation; the patient, a boy, aged ten with a tumor of the tibia of fifteen months' duration; the new-growth was in the medullary cavity, a small circumscribed tumor which had perforated to the periosteum at one point only; it was chiefly a spindle-cell sarcoma with a few giant cells; the operation consisted of resection of 15 cm. of the tibia with implantation of the fibula into the defect; the functional result, even with 4 cm. shortening is excellent. This case may be considered additional evidence against amputation.

Kramer's Case 6 has remained well ten years since operation. The patient, a male, aged eighteen, tumor nine months; a medullary round-cell and spindle-cell sarcoma, entirely confined within a bone capsule.

Bockenheimer² in discussing the total excision of the scapula, which I have referred to under Osteomyelitis, mentions a periosteal round-cell sarcoma of the scapula, in which the patient remained well nine years after operation. The patient was a male, aged forty-five; the swelling in the region of the shoulder had been observed one year; it was a periosteal tumor involving the scapula in the region of the shoulder-joint; total excision of the scapula with tumor was performed. The pathological report states that it was a round-cell sarcoma. There is no note whether there was bone formation in the tumor or not.

Amputation at the Shoulder-girdle for Sarcoma. A complete *resume* of the technique of this operation with its indications has recently appeared by three French surgeons: Berger,³ Jeanbrau, and Jeanbrau et Riche.⁴ The operation is not a difficult one; 188 cases have been reported by sixty-six surgeons, in which the indication was furnished by a malignant tumor. The operative mortality since 1877 is less than 8 per cent., and among 105 cases in which the ultimate result is known, 22 have lived more than five years since operation.

These three surgeons are to a certain extent more interested in the operative technique of the removal of the upper extremity with the scapula,

¹ Archiv. f. klin. Chir., 1902, vol. lxvi, p. 796.

² Ibid., 1905, vol. lxxv, p. 1.

³ Revue de Chir., 1905, ann. xxv, No. 8, p. 187.

⁴ Ibid., pp. 153 and 160, reviewed in Centralbl. f. Chir., 1905, vol. xxxiii, pp. 162 and 170.

than in the relation of the ultimately cured cases to the pathology of the tumor. They classify the tumors removed by this method of amputation into the following groups: round-cell sarcoma, 46 cases, 5 lived over three years; spindle-cell sarcoma, 21 cases, 5 cured; giant-cell sarcoma, 9 cases, 4 cured; mixed-cell sarcoma, 27 cases, 5 cured; chondrosarcoma, 11 cases, 7 cured; miscellaneous malignant tumors, 10 cases, 3 cured.

I employ the term cured simply to indicate those patients who remained well at least three years after operation. The difficulty of the correctness in ascertaining ultimate results is illustrated in their case No. 32, recorded as a round-cell sarcoma and apparently well four years after operation. This patient was reported by Cushing;¹ it was a medullary sarcoma of the upper end of the humerus, and the patient lived two and a half years after operation. This case represents the longest duration of life after operation among the cases of round-cell sarcoma of bone observed in Dr. Halsted's clinic. Among the other four cases reported by Jeanbrau of round-cell sarcoma, two were apparently well six and seven years, respectively, after operation.

This rather rough pathological classification based upon cases from different surgical clinics comes to about the same conclusion that we have given in *PROGRESSIVE MEDICINE*, *i. e.*, that spindle-cell and round-cell sarcoma is a very malignant tumor, and the relative number of cures is small.

Just what these authorities include under giant-cell sarcoma (*sarcome à myélopaxes*) I am not prepared to say, but the fact that four out of nine cases remained well three years and more is an indication of the relative benignity of the tumor. It is a mistake to call all sarcomata of bone which contain giant cells, giant-cell sarcoma.² Many spindle-cell, round-cell, mixed spindle-cell and round-cell sarcomata contain giant cells. It is the report of such cases under the diagnosis of giant-cell sarcoma that has given rise to the impression that the pure giant-cell tumor may give metastasis. Among the five cases reported by these authors as not cured three years after operation there was metastasis in four. I am inclined to the opinion that a more careful pathological study of the tumors in these cases would demonstrate them to be mixed-cell sarcomata containing giant cells.

These surgeons include under the diagnosis mixed-cell sarcoma the ossifying tumor, and, as a matter of fact, among the five cases recorded as cured three were ossifying sarcomata—tumors which should be studied in a group by themselves.

¹ *Annals of Surgery*, 1902, vol. xxxvi, p. 325.

² *PROGRESSIVE MEDICINE*, December, 1905, p. 279.

The group chondroma includes both the benign and malignant cartilage tumors, but the relative benignity of cartilage tumors is demonstrated by the fact that seven out of eleven cases were apparently well three years or more after operation, and of the four remaining patients one died of operative shock, one was lost track of, a third case is living and apparently well twenty-two months after operation, and in only one did the patient succumb to metastasis, a chondrosarcoma of the humerus.

The three patients recorded among the miscellaneous tumors who lived three years or more after operation, are of considerable interest. One, an example of a pure myxoma which I have just discussed. In this instance the tumor infiltrated the surrounding muscles; the patient is apparently well three years and seven months after operation. It is a question whether the second observation should be considered a malignant tumor. The upper extremity was covered with multiple fibroma molluscum, which had ulcerated. One year after the high amputation a second tumor was removed from the skin of the axilla. This patient remains well five years later. In the third case the tumor was a malignant epithelioma in the scar of a burn over the shoulder. The longer duration of life in malignant epithelial tumors and the possibilities of late recurrence are illustrated here. The patient died nine years after the operation, from recurrence.

One should never hesitate to remove the upper arm with the clavicle and scapula if it is indicated by the extent of the local growth. This method of amputation is even simpler than a disarticulation at the shoulder. Berger's method is the best. It begins with the resection of the clavicle near the sternum and immediate ligation of the subclavian artery, later of the vein; ligation of the artery first prevents accumulation of blood in the arm. In weak and anemic individuals the arm should be elevated and bandaged, even with a light Esmarch, in order to save as much blood as possible. It is also a good plan to cocaine the nerves before their division to lessen shock. In my limited experience the operation proved to be a very simple one, quickly performed, and should have a very low mortality.

I have not had time to study all of these cases of inter-scapulo-thoracic amputations. In many the extent of the local growth undoubtedly indicated this radical procedure, in others the tumor could have been completely removed by a less radical procedure, which would have left an arm with some function. In a recent experience of my own a malignant medullary sarcoma of the outer third of the clavicle was just as completely removed by local excision as it would have been if this method of amputation had been followed. Bockenheimer's¹ investigations demon-

¹ Loc. cit

strate that the total excision of the scapula for new-growth is feasible, and that the arm retains considerable function, and in some cases, a plastic operation on the trapezius and pectoralis major will improve motion at the shoulder. The older view that a total excision of the scapula left an arm without function is incorrect. Over half of the humerus may be resected and the forearm will be of considerable value to the patient.

The fact, brought out in the discussion of osteomyelitis, of almost complete bone regeneration after subperiosteal resection, can seldom be utilized in malignant tumors, because the periosteum is involved in the new-growth. In some cases, however, of less malignant tumors, situated in the medullary cavity and surrounded by a zone of uninvolved cortical bone, subperiosteal resection is justifiable.

Conservative Operations for Malignant Tumors of Bone. In recent literature, I find but two articles in which this question is especially considered. Sommer¹ in a dissertation agrees with the position taken in my discussion of bone tumors. The article is based upon a resection of fifteen centimeters of the shaft of the femur and the removal of a round- and spindle-cell sarcoma. The tumor in one place had broken through the bone and involved the popliteal space; two years after operation there was no evidence of recurrence. The patient had to wear a brace on account of slight mobility at the site of bone suture.

Burci² considers conservative operations in sarcoma of the scapula and records a periosteal osteosarcoma of the scapula in which there is no evidence of recurrence six years after a local resection. In looking over the literature he found fifty-two cases on record. Of these at least 50 per cent. have been apparently cured.

BIER'S TREATMENT WITH HYPEREMIA.

It will be impossible to discuss in detail in a short space this method of treatment which was instituted by Professor Augustus Bier about fifteen years ago. In 1892 when I visited v. Esmarch's clinic in Kiel, I had the opportunity to witness the beginning of the use of the Esmarch bandage in the treatment of tuberculosis and infections. Bier's accumulated experience has just been published in book form.³

The subject was extensively discussed at the recent German Surgical Congress⁴ in April, 1906. At this meeting, Bier's assistant Klapp⁵ pre-

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 541.

² Ibid., vol. xxxiii, p. 1254.

³ Hyperämie als Heilmittel, third revised edition, thirty-nine illustrations, published in Leipsic, by F. C. W. Vogel, 1906.

⁴ Centralbl. f. Chir., 1906, vol. xxxiii, Supplement No. 28, p. 6.

⁵ Archiv. f. klin. Chir., 1906, vol. lxxx, p. 42

sented a paper on the treatment of surgical tuberculosis with the cupping method. The subject has received but scanty attention in American literature. Hartwell,¹ of Boston, reports very favorably on his experience in ten cases, chiefly gonorrheal and tuberculous arthritis.

Bier bases his hyperemic treatment on the fact that the exudate in an inflammatory process is nature's means of combating local infection. In active hyperemia more blood than normal flows through the tissues from the arterial circulation. This can be produced to a certain extent by any irritation of the skin or subjecting the part to superheated dry or moist air. Superheated dry air is the best means, because higher temperatures are possible without the danger of a burn. For example, Bier was able to hold his forearm in superheated dry air in a temperature of 105° C. (221° F.), while in hot water only to 44° C. (111.2° F.). In addition, when a part of the body is subjected to hot water or steam, not only is there danger of a burn, but there is an inflammatory edema, which is not rapidly absorbed. Passive hyperemia is best produced by obstructing venous circulation with an Esmarch bandage or the vacuum of a glass cup or bell. In the active hyperemia produced by superheated dry air, or the passive hyperemia with the Esmarch or cup, the object is to get quickly a fresh serous exudate into the diseased tissues which will be rapidly absorbed and will allow a repetition of the treatment. This exudate in passive or active hyperemia soon loses its bactericidal properties.

There is sufficient experimental evidence by Bier and others that the exudate produced by passive or active hyperemia aids the tissues in combating infection. I have quoted in previous numbers of *PROGRESSIVE MEDICINE* experiments on animals, in which virulent streptococci were injected into an extremity. The animals treated with an Esmarch on the limb above the point of infection as a rule recovered, while the control animals, not so treated, died.

Active and passive hyperemia, therefore, can be employed in selected cases for the treatment of infections, acute or chronic. It is also beneficial to aid in the absorption of the scar tissue in chronic inflammatory lesions. It is made clearly evident by the author of this treatment that it has its limitations; in some cases results can be accomplished by this method alone, in others it should be used as an adjunct, while in some lesions it is contraindicated, for example, erysipelas, lesions complicated with thrombosis of the veins, or marked arteriosclerosis. It has not been found of any value in syphilitic inflammation. In acute inflammations one should expect immediate results. In chronic lesions, especially tuberculosis, the method must be employed daily for weeks and months.

The Method of Applying the Esmarch Bandage. One should use a soft, pliable rubber bandage long enough to encircle the limb three

¹ Boston Med. and Surg. Jour., May 3, 1896.

or four times. To fix the end all that is necessary is to wet it, when cohesion is sufficient to prevent slipping. Fig. 23 will illustrate the method for the arm and the thigh. For all lesions of the upper and lower extremity the Esmarch should be placed above the elbow or knee. Fig. 24 illustrates a method which can be applied to the shoulder and hip.

In applying the Esmarch to produce passive hyperemia it should relieve and not give pain. The pulse should never be obliterated.

The Application of the Cups. This apparatus is used for two purposes—one, to produce passive hyperemia for areas of infection not accessible to the Esmarch, such as furuncles on the face and back, or the early stage of lactation mastitis; the other, to draw pus out of a sinus when there is a fistula formation. For example, in tuberculosis

FIG. 23



FIG. 24



of a joint with sinus formation, in addition to the Esmarch above the joint, a cup is placed over the sinus or, after the incision of an acute or chronic abscess, the cavity is not packed or curetted, but a cup is applied at intervals during the twenty-four hours.

Fig. 25 *a* is an illustration of a small cup. The rubber bulb is pressed in proportion to the degree of vacuum to be created, the glass cup is placed over the area of infection or the sinus. Now, as the pressure on the bulb is relaxed, a vacuum is created, and the tissues are drawn into the glass cup. The pressure of the rim upon the skin and the negative pressure within the cup, of course, produce a local hyperemia. If there be a sinus the discharge is withdrawn into the cup. Before applying the cup the skin should be anointed with some sort of fatty ointment. In acute infections the vacuum should be less than in chronic.

When there is considerable discharge, the apparatus illustrated in Fig. 25 *b* can be employed. In mastitis a cup large enough to include the entire breast is used, as illustrated in Fig. 25 *c*. An exhaust pump, in this case must be attached to produce the vacuum.

FIG 25

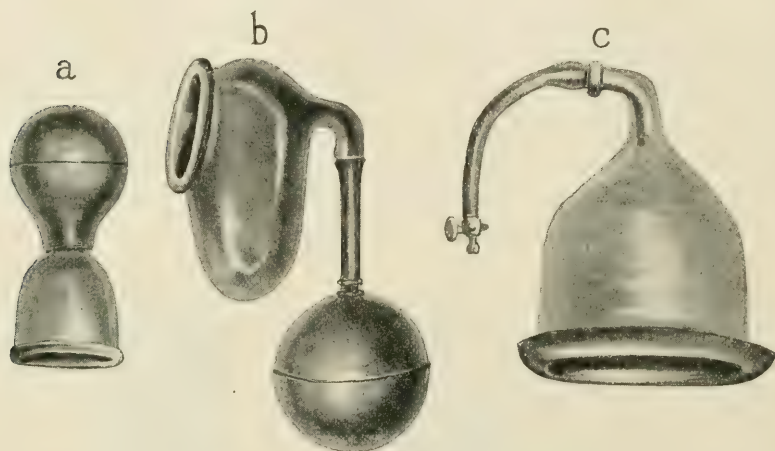


FIG. 26

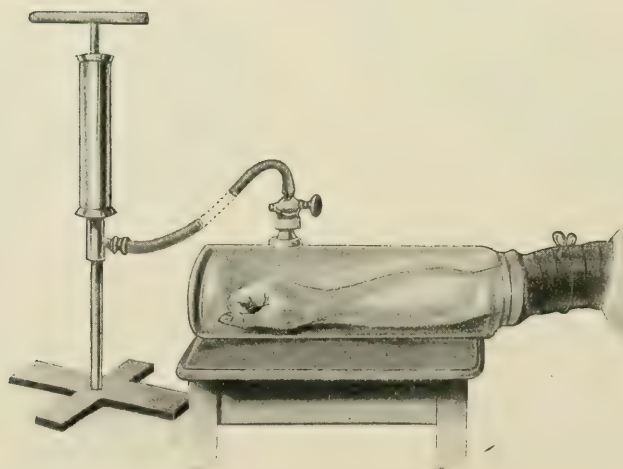


Fig. 26 shows how the entire forearm can be placed in a vacuum. The hyperemia can be increased by an Esmarch on the arm.

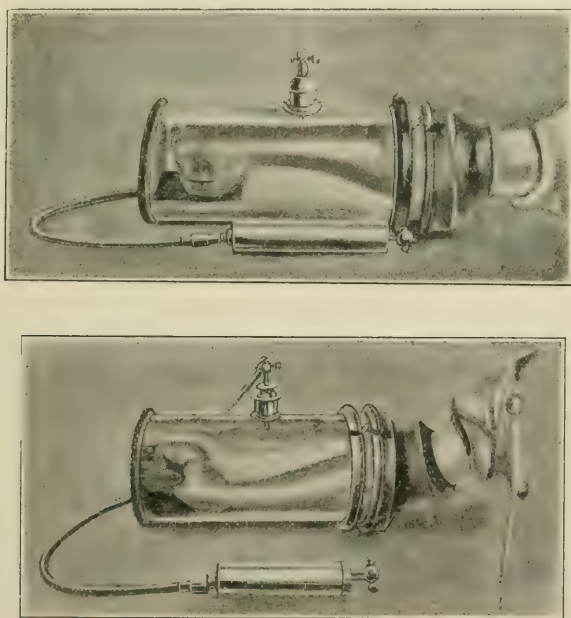
I will not reproduce the illustrations for the application of superheated air, because this apparatus is well known.

Bier is also interested in devising an apparatus which will encase the joint in a vacuum and combine it with one which will give motion

in the partially ankylosed joint. This is illustrated in Fig. 27. One can see how, when the air is exhausted, the external atmospheric pressure will force the forearm down with a steady and gentle pressure on the wrist, and as air is again let in the vacuum a reverse motion is produced. Bier claims that passive motion under hyperemia is less painful.

The Esmarch and the cup are very simple; they can be used by the patients themselves, and in the dispensary clinic. The other apparatus is for hospital treatment or for office practice. As to the minutiae of detail of the more complicated apparatus I must refer the reader to Bier's

FIG. 27.



book, but I am impressed from the book itself and from the excellent discussion in the recent German Surgical Congress, that this method should be given a trial, and employed both in hospitals and in private practice.

In acute infections it should be used cautiously, and one should not delay operative intervention when indicated. But I am inclined to agree with Bier, that if one uses his hyperemia in the early stage of infection, resolution will take place in many cases without incision. In other cases, when combined with incision, the operative interference can be less extensive. My personal experience is yet too small to render a verdict at this time. In tuberculosis I have had more experience, with some

apparently happy results. I have just sent a case of tuberculosis of the shoulder to the Adirondacks, with the advice to use the apparatus shown in Fig. 24. Some two months ago, after opening and irrigating a primary tuberculous synovitis of the knee, I taught the patient how to apply the Esmarch, and he is now living an out-door life in the country, walking on crutches, and applying the Esmarch three-quarters of an hour every day. At this time there is good motion in the knee, no pain or effusion. Results, however, can be accomplished without the use of the Esmarch. In January a boy of eleven came under my observation with pain, restriction of motion, and effusion into both knee-joints; he had been confined to bed for six months and was in a wretched physical condition. There was no evidence of tuberculosis of the lungs, but a general and marked local reaction to tuberculin. He was kept in bed from January to June on the porch of a general hospital, and improved in weight and general condition. At this time an examination and *x*-rays of both knees was absolutely negative. He was sent to a country hospital and by August, although against orders, was playing base-ball with the other children. Now, September, he has returned again to the city in apparently perfect health, with absolutely no symptoms referred to the knee. This result was accomplished by fresh air and rest only, but, of course, in the early stage of tuberculosis.

The chief advantage of open air, rest, and Bier's hyperemia is that they accomplish results without operation, and with restoration of function. These means must be employed in the very early stages. When operation is indicated this method of treatment should be continued, but one cannot expect miraculous results.

The attitude of surgeons toward acute and chronic infection should change, and the happy medium between ultra-conservatism and operation in every case be established. Both extremes have their dangers. Each individual case must be carefully studied. No general rules or routine treatment for all cases can be laid down. The best results in every case depend upon the physician's art in applying the proper treatment. Bier evidently has made a contribution of the greatest importance to conservative treatment, and, in addition, has developed a method which can be employed in conjunction with operative intervention. I trust next year to devote more space to the literature on this subject and to be able to report on my own experience.

Discussion at the German Surgical Congress on Bier's Hyperemia. The following are the most important points brought out by the various colleagues of Bier in their discussion of his treatment. Lexer is practically the only surgeon who does not indorse the method to its fullest extent.

Habs (Magdeburg) finds the following contraindications: (1) erysipelas,

(2) the presence of vein thrombi (embolism of lung in one case), and (3) diabetes. Arteriosclerosis is not a contraindication. Hyperemia by obstruction was employed as a prophylactic in four cases of injuries which came under treatment late and in a contaminated condition; after the extraction of foreign bodies, etc. In every instance suppuration was prevented. Obstruction is not effective in syphilitic infection.

Körte (Berlin) has employed obstructive hyperemia in a gangrenous felon of the finger in a diabetic patient. The gangrenous area sloughed and the finger healed.

Croce (Berlin) reports from Rotter's clinic that their results were not satisfactory in osteomyelitis, and recommends small incisions, even in beginning phlegmons, as they do no harm. The employment of the suction bell in felons is sometimes painful and does not give good results. But in subpectoral and axillary abscesses it has done good service. In perityphlitic abscess artificial hyperemia has given good results when there was no communication with the intestine. It is excellent in stitch abscess after operation.

Sick (Hamburg) has treated 250 cases with Bier's methods with mostly good effect, especially in grave phlegmons. He emphasizes the relief of pain, the more rapid healing, the better functional result. A deleterious effect was observed in a streptococcus phlegmon; here acute gangrene took place. Likewise in diabetics, in varicose ulcers and thromboses, respectively, in thrombophlebitis, the effect was not good. One patient died. In some cases of erysipelas the method was excellent, but in one case great swelling and pain necessitated the removal of the Esmarch, which could not stay the extension of the disease. This also occurred in a few cases of obstruction employed in suppurating wounds. Two cases of anthrax healed well, one patient could not stand it on account of considerable reactive edema. In one case of osteomyelitis of the tibial diaphysis suppuration of the knee-joint took place. On the other hand, a girl with angina and suppurating shoulder-joint was cured by the method. The method should only be practised in hospitals, since it requires constant supervision.

Stich (Breslau) reports the experience of Garre's clinic, which embraces over 200 well-recorded and numerous other lighter cases, all with a good result. The results were excellent in tendon-sheath phlegmons and panaritias. This is attributed, in addition to the passive hyperemia, to small incisions, and no packing. One unfavorable case must be attributed to technical difficulties, as the enormous reactive edema frequently prevents the early recognition of the presence of pus.

In acute osteomyelitis obstructive hyperemia has frequently failed, even in early cases. Garre for this reason intends to again open the bone at once. The results from the employment of the large suction

bell in mastitis were uniformly good, after the introduction of a small drain when, a few days after the incision, pus ceased to flow. He has observed no disadvantages from the treatment. It seems to have particular prophylactic effects in wounds suspicious of infection, for instance after primary tendon suture.

Danielsen (Marburg) has treated 260 cases with Bier's method, a number of them in the dispensary, with 2 per cent. failures. Even though symptoms of inflammation do not disappear in a few days, the treatment should not be discontinued. Only when the inflammation extends beyond the area of artificial obstruction, the old methods of treatment are indicated. He has observed preservation of function even in cases of partial necrosis of the tendons.

Bardenheuer (Cologne) professes himself an ardent admirer and follower of Bier's hyperemia. He calls attention to the fact that, in the beginning of the treatment, errors in the technique are easily made and enumerates the more common ones. Not until, through the courtesy of Professor Bier, he had temporarily exchanged assistants with the latter, was proficiency in the employment of the method acquired, and the results since then have been excellent. The treatment requires a great deal of attention and experience, and should not be entrusted to different assistants in the clinic. Bardenheuer discusses his results and emphasizes the efficacy of the method in all forms of inflammation. The results were very good in tendon-sheath phlegmons, in acute suppurations of the joints (knee, ankle, shoulder, elbow, phalangeal), in acute purulent osteomyelitis and periostitis, in phlegmonous bursitis, in other phlegmons, in gum-boils, carbuncles, and abscesses.

Heidenhain (Worms) emphasizes (1) that one should carefully see that the edema disappears completely in the interval between the applications of the Esmarch, and that later on the time of the application of the bandage should be gradually decreased; (2) that pus be always evacuated. Since he has noticed the remarkable softness of the scar tissue after hyperemia, he employs it prophylactically twice daily in all injuries of the fingers.

Lexer (Königsberg) compares the theoretical foundations of the older methods of treatment with Bier's hyperemia in acute infections, and arrives at the conclusion that the employment of the natural resources of the organism in combating the infection as against the older method of prompt evacuation of the pus by incision, is only devoid of danger in the lighter forms, while in the graver cases it is a risky thing, since more than in any other treatment the result must depend upon the gravity of the infection and the resources of the organism. He, however, recognizes the efficacy of Bier's hyperemia treatment in wide-open accidental and operation wounds, or when infectious foci have already been incised

before the employment of the Esmarch, and for this reason recommends it only as a substitute for packing. The cupping method acts rapidly and effectively in cases of soft infiltration or areas of necrosis in furuncles; while in diffuse, still progressive inflammations, notwithstanding early incision, the healing is easily retarded, and the results not as good as in incision without cupping.

Perthes (Leipsic) discusses his experimental work to determine the relation of the aspiration and hyperemia to the effect of the cupping treatment. He recommends early incision, with the employment of the cups, when both aspiration and hyperemia supplement each other to the best advantage.

He describes a contrivance for the regulation of the degree of vacuum within the bell.

Hofmann (Karlsruhe) has employed abdominal hyperemia by an Esmarch and has thus cured a phlegmon of the bladder after obtaining dry gangrene. The Esmarch was placed about the abdomen in the umbilical zone.

Others who reported on their experience with Bier's methods of hyperemia were Heller, Küster, Ranzi, Haasler, Blumberg, Stettiner, and Katzenstein.

Klapp, Bier's assistant, then discussed a few technical details. The bad results reported in the discussion he attributes to lack of patience and technical errors.

Bier closed the discussion by briefly reviewing his experience with the treatment in 1500 acute inflammations, in 1100 of which the cupping methods were employed. In joints he emphasizes the fact that, not only lighter metastatic cases, but also severe traumatic suppurations were favorably influenced. Of 28 cases of otitis, 27 of which were complicated with mastoiditis, 16 healed with good hearing function, after small incision of the abscess. He admits that in erysipelas and streptomycosis the results were not always good.

While pain is not always a contraindication to the use of the hyperemia, when it becomes a question of technique, the general rule is that hyperemia should not cause pain, but relieve it; that it should not produce necrosis, but avoid it; that inflammation is not a harmful, but useful process.

SURGERY OF THE JOINTS.

Non-tuberculous Arthritis. REGENERATION OF CARTILAGE. The experimental work of Mori,¹ of Japan, in the Pathological Laboratory of the University of Bonn, is of interest, but has not been carried far

¹ Deutsch. Ztschr. f. Chir., 1905, vol. lxxvi, p. 220.

enough to be utilized in practical surgery. He has demonstrated, however, that some regeneration does take place from both the old and new cartilage cells near the wound. The greater part of the regeneration, however, is produced by the perichondrium. If a piece of cartilage is chipped off and placed against another cartilage defect, healing takes place by regeneration and not by scar tissue. Whether this experimental work will lead to transplantation of cartilage in lesions of the joints is as yet a future possibility.

Seggel¹ contributes the most extensive experimental investigation on the changes of the cartilage since the work of Barth and Vollbrecht.² His experimental work, first, considers the changes in a piece of cartilage taken from the joint and transplanted into the abdominal cavity; second, the reactive changes in the cartilage about the defect in the joint; third, the part played by cartilage in tuberculosis and other joint lesions. The contribution is an extensive one and concerns chiefly cellular pathology. He has demonstrated that the transplanted piece of cartilage retains its vitality; it becomes surrounded by a zone of new connective tissue which supplies it with nutriment; at first there is evidence of degeneration changes, but very quickly there is new cell activity and positive evidence of reactive processes in the transplanted piece of cartilage. Later bone may form from the cartilage itself. This confirms the work of Barth in regard to the loose cartilage bodies in the joints of human beings, which I have fully discussed. The reactive changes in the defect are as a rule slight; the defect becomes covered with a connective-tissue capsule, and the quantity of new cartilage tissue which forms is but small. If the defect is near the synovial border, the reactive processes are very much greater. A vascular pannus spreads over the defect from the synovial membrane and the amount of new cartilage formation is considerable. In regard to changes in the articular cartilage in joint diseases, the majority of authorities have considered that its part is entirely passive. Seggel in his histological investigation of tuberculosis has demonstrated that in certain cases there is definite evidence of reactive changes in the cartilage. These changes have no relation to primary synovial or bone tuberculosis, but do have a definite relation to the degree of irritation, which of course depends upon the virulence of the toxins. When this irritation is below a certain degree the regenerative changes in the cartilage are the same as after a traumatism. If the amount of irritation is greater, only degenerative cellular pictures are observed.

In my experience the most interesting field for investigation is not in tuberculosis, but in traumatic arthritis with cartilage defects, in arthritis

¹ Deutsch. Ztschr. f. Chir., 1904, vol. lxxv, p. 326; and 453; Ibid., 1905, vol lxxvi, p. 42.

² PROGRESSIVE MEDICINE, December, 1899, p 203

deformans, and the arthropathies of tabes and syringomyelia. In this group of cases small pieces of cartilage break off from the articular surface, become attached by transplantation to the vascular synovial membrane, form loose, pedunculated and sessile cartilage bodies, some of which become ossified. These cartilage new formations become etiological factors in keeping up joint irritation and hydrops, and may lead to further disorganization which will be discussed later.

FREE JOINT BODIES. One interested in this subject will find an excellent discussion of the literature by Connell,¹ who also reports observations of his own, with good illustrations. I find, however, nothing new since my discussion of the subject in 1899. In every recent communication the disputed question of how the loose bone-cartilage body becomes separated from the articular surface of the joint is discussed. Barth and Vollbrecht from their experimental work are of the opinion that it is purely traumatic. Cornil and Coudray² and Riemann³ practically repeat Barth's experimental work and agree with his conclusions. The communication, however, which interests me most comes from the pen of Professor König,⁴ who must be considered the chief authority on the pathology and surgery of joint diseases. This original communication in the *Centralblatt f. Chirurgie* was stimulated by the papers of Riemann, Cornil and Coudray, who dismissed König's view curtly and apparently are unfamiliar with his extensive communication, especially one by Martens.⁵ König's argument cannot be refuted. The experimental work which removes with the chisel a piece of the articular cartilage does not prove that this always happens in the human joint through a trauma. What happens to the cartilage after its separation in these experiments on animals, or in clinical observation, has nothing to do with the question. What is to be demonstrated is the etiology of the separation. König's clinical experience is so large that it commands respect, nor does it differ from the clinical experience of other surgeons. Patients with loose joint bodies seldom give a history of a severe trauma; many have forgotten the trauma, if there had been any. When the joint is opened, in the majority of cases, nothing is found but the loose body, and in some cases the position of the defect. There is no evidence of any other joint disease; the symptoms are relieved and the patients, when followed, do not show evidence of tuberculosis or arthritis deformans. Barth's statement that a microscopic examination of the defect in a few cases showed no cellular evidence, except that which could be explained by a trauma,

¹ *Annals of Surgery*, 1906, vol. xliii, p. 247.

² *Revue de Chir.*, April, 1905.

³ *Virchow's Archiv.*, vol. xc, No. 3.

⁴ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 809.

⁵ *Deutsch. Ztschr. f. Chir.*, vol. liii, p. 348. From König's clinic.

and resembled in every detail the defect in the articular surface of the animal experiments, does not exclude the possibility of König's view, that there is something besides traumatism. Seggel's experimental work and clinical investigation demonstrates that the reactive and degenerative changes in cartilage are the same after trauma, as after disease. König's view, which, of course, he cannot prove, is that the cartilage is not separated completely by a trauma, but a small area is injured by a slight trauma and the piece of cartilage sloughs as a piece of skin would slough after injury if its vitality were impaired. The process which causes the sloughing he calls osteochondritis dissecans.

NEW METHODS OF DIAGNOSIS IN JOINT AFFECTIONS. On this subject I find only two communications which may be considered as adding to our diagnostic methods. Robinson and Werndorf¹ recommend the distention of the joint by injecting into the capsule oxygen. On the *x-ray* plates now made, the differentiating shadows are much more distinct, and lesions of bone, cartilage and soft parts are more clearly outlined. In their demonstration of Röntgen negatives of various lesions in which this method was employed they undoubtedly have added to expert methods of diagnosis. They were led to use oxygen, because Gärtner, from his experimental and clinical investigations, has proved that oxygen gas injected directly into the circulation is not harmful. Gärtner, of course, uses oxygen infusions for certain diseases in which oxygen was necessary for life, with good result. As it is quite possible, when injecting a joint with oxygen to have some of the gas get into the circulation, it is necessary, therefore, to employ a gas which is harmless and cannot produce embolism. For this reason atmospheric air should not be employed, but only chemically pure oxygen.

In many forms of arthritis, both acute and chronic, the changes in the bone and cartilage are so slight that there is needed some method which will aid in the portrayal of changes in the soft parts, which, with present methods, are difficult to recognize in the ordinary *x-rays*. There is one objection to the injection of oxygen into joints. In the obscure cases the possibility of a primary joint sarcoma must always be borne in mind, and such a gas injection might produce metastasis. At the present time I should much prefer an exploratory incision.

Alban Köhler² has contributed a monograph on the *normal and pathological anatomy of the hip-joint and the upper end of the femur*, with special reference to radiographic studies. The *x-rays* are very commonly employed in this country. The best results, however, are frequently not obtained. Perhaps poor *x-rays* are better than none. However,

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 826

² Ibid., 1906, vol. xxxiii, p. 49.

the unsatisfactory *x*-ray negatives which I have studied, and then compared with a negative taken by Dr. Baetjer, the expert radiographer of the Johns Hopkins Hospital, have rather convinced me that a bad *x*-ray may be a source of a dangerous error. Communications of the character of Köhler's are forcible demonstrations that the taking and developing of an *x*-ray plate should be delegated to the expert, and that Röntgen photography is a recognized specialty. It is a great pleasure to recommend the splendid communications of Preston M. Hickey, of Detroit, Michigan, and Dodd and Osgood, of Boston, which have recently appeared in the first volume of the *American Practice of Surgery*, edited by Bryant and Buck, and to congratulate the publishers, William Wood & Co., on the excellence of the reproductions.

TUMORS OF JOINTS. The lipomata which not infrequently occur in the joints I have discussed.¹ Both benign and malignant neoplasms originating in the synovial membrane or joint capsule are rare. The malignant tumor is frequently confused with tuberculous synovitis, and the benign with the fixed joint body or chronic villous arthritis Bogolyuboff² records an observation of a fibrolipoma springing from the joint capsule in which he found islands of cartilage and bone. The patient was a boy, aged five years; for four years there had been observed a tumor in the flexor cavity of the elbow; there was no pain and no restriction of motion; on examination, the tumor was small and oval, but could not be pushed back into the joint. At the operation it could be enucleated, except at its pedicle, which arose from the capsule of the joint, and when this was excised the joint capsule was opened. Such a tumor should be looked upon rather as an extracapsular joint tumor. The occurrence of bone and cartilage are of interest. Gaugele³ looks upon fatty joint tumors as of inflammatory origin, and reports four cases in which the tumors were removed from the knee-joint, with good results. Traumatism was an etiological factor in two cases. He refers to cases with symptoms of flat-foot associated with lipomata of the ankle. These patients were relieved by the removal of the fatty tumor. I have one such observation. Zezas⁴ records a very interesting cavernous angioma arising from the synovial membrane of the knee-joint. The chief symptoms were pain and intermittent swelling of the knee in a male aged thirty-five. There was no restriction of motion and no history of trauma. When the patient was treated with rest the pain and swelling disappeared to return very quickly after walking. At the examination the swelling about the knee-joint corresponded to the clinical picture

¹ PROGRESSIVE MEDICINE, December, 1899, p. 213.

² Centralbl. f. Chir., 1905, vol. xxxii, p. 1257.

³ Ibid., p. 1263.

⁴ Deutsch. Ztschr. f. Chir., 1906, vol. lxxxii, p. 267

of an effusion; on palpation one could make out a soft elastic thickening of the capsule, which was most marked to the inner side of the patella. The x-rays were negative. Had this joint been aspirated, a bloody effusion would have been found. We have, therefore, a clinical picture which does not differ from diffuse sarcoma of the synovial membrane which I will consider next. At the exploratory incision the soft mass to the inner side of the patella proved to be a very vascular tumor which infiltrated the surrounding joint capsule and invaded the muscle; it filled up the joint with a villous growth; there was also a hemorrhagic effusion. The internal ligaments and articular cartilage were normal. The diseased tissue was excised and the wound closed. The patient left the hospital eight weeks after operation with almost completely restored joint function. In this case, at the exploratory incision, the peculiar vascularity of the tissue, I think, would have allowed a differential diagnosis from sarcoma. The presence of the vascular tissue in the muscle and capsule would differentiate the lesion from a villous arthritis in which the new growth, in my experience, has been entirely within the capsule. The good result from excision of a large part of the synovial membrane demonstrates the operability of such lesions. I have observed a somewhat similar case in the region of the ankle-joint except the tumor was very much larger and of longer duration. In recent observations on chronic arthritis of the knee-joint with great distention of the capsule and chronic villous arthritis I found that, after considerable removal of the synovial membrane, complete restoration of joint function should be expected.

For benign tumors arising from the synovial membrane complete excision should be employed, and one can insure the patient of a relief from the symptoms with but slight or no impairment of function. In every obscure lesion of a single joint one should not forget the possibility of a primary sarcoma of the synovial membrane. It is very fortunate that in recent literature all of these cases observed in the knee-joint are reported in detail by v. Rüdiger-Rydygier.¹ He was able to find nine cases in the literature. In not one of these was a correct diagnosis made until operation. In the tenth case the younger surgeons admitted the patient to the surgical clinic with the diagnosis of tuberculous synovitis of the knee. They were very much surprised and chagrined when the chief of the clinic, after going over the patient very carefully, exhibited the case to the students as an example of a rare primary sarcoma of the synovial membrane, a diagnosis confirmed at operation and by the pathological report. This individual was a female aged twenty; two years ago, after suffering with pain and swelling in the knee-joint for a few months,

¹ Deutsch. Ztschr. f. Chir., 1906, lxxxii, p. 211.

she sought medical advice; at that time aspiration withdrew blood-stained fluid, but this was not correctly interpreted, and the patient was treated conservatively for tuberculous synovitis. As there was no improvement the patient came to the surgical clinic. The knee-joint had that characteristic swelling so frequently observed in tuberculous synovitis, but it had been present two years, and there was practically no restriction of motion, very little pain and tenderness, no atrophy of the muscles; the *x*-rays showed no changes in bone or cartilage, and the aspiration demonstrated a very bloody fluid. A clinical picture, however, which, I think, could not be differentiated from Zezas' case of cavernous angioma. So much blood is never observed in tuberculosis, and in my experience, in the very vascular chronic villous arthritis hemorrhagic effusion has not been present. In chronic arthritis deformans with erosion of the cartilage I frequently observed hemorrhagic effusion, but only in the later stages of the disease, when a differential diagnosis is not difficult. In scurvy, hemophilia, and purpura the bloody joint effusion is rarely associated with thickening of the capsule, and the lesion is usually multiple. The presence, therefore, of hemorrhage in the joint effusion should make one suspect sarcoma, and before the exploratory incision the patient should be prepared for the more extensive operation.

In summarizing the clinical picture and pathology of primary sarcoma of the synovial membrane two distinct forms must be recognized. In one the tumor is a circumscribed nodule, very much like the lipoma which I have discussed; this variety is of less interest and importance. For example, Annandale in 1896 removed a bean-sized tumor from the capsule of the knee-joint in a woman aged thirty-three, which had been observed eighteen months. Microscopically the tumor was a giant-cell sarcoma, and there was no recurrence eight years after operation. Weir in 1886 reports two similar cases—one a giant-cell sarcoma, the other a fibrosarcoma, both small pedunculated tumors, easily removed without much injury to the capsule. These three tumors, of course, were relatively benign. In the observation of Marsh reported in 1898 the tumor was less circumscribed and much more malignant; the patient was a male aged twenty-one and had observed a swelling over the internal condyle of the femur for fourteen months; it was the size of an orange, not fixed to the bone, the skin over it normal. What justified his diagnosis of tuberculous periostitis is not stated. The tumor was excised, was quite vascular, contained some cysts, and was composed of spindle and round cells. That the local excision was incomplete is established by the fact that three recurrent tumors were removed, and finally, five years after the first operation, the leg was amputated. Other tumors were found within the joint, springing from the synovial membrane.

This observation demonstrates the relatively low grade of malignancy of this tumor. The ultimate result of the case is not given.

The remaining six cases including the one reported by v. Rüdiger, are examples of the second variety in which the new growth infiltrates the entire synovial membrane. In some cases there are, in addition, circumscribed nodules. The clinical picture is rather uniform—adults, no history of trauma; onset with pain and diffuse swelling of the knee which, although the lesion may be present a number of years, seldom restricts motion or prevents walking; from external appearances the knee-joint does not differ from that seen in primary tuberculous synovitis, except in tuberculosis, after an equal period of time, one would expect more restricted motion, impaired function, and muscle atrophy. The *x*-rays show no cartilage or bone defects. In none of these cases was tuberculin given. Aspiration withdraws bloody fluid, which impresses me as the most important diagnostic sign. On palpation the capsule is distinctly thickened, the circumscribed nodules, present in some cases, would not differentiate from tuberculous synovitis or the multiple luetic synovitis gummosa. At the exploratory incision the entire synovial membrane is replaced by an irregular new-growth. Cysts containing serous and bloody fluid are very frequent, the masses of tissue are friable and easily broken, there are solid areas, whitish in color—a picture, therefore, which one could readily distinguish from a benign angioma, villous arthritis, tuberculous or syphilitic synovitis. In the early stages the synovial cartilage and muscles are not infiltrated. Microscopically the tumors are usually spindle-cell and round-cell sarcoma, a histological picture which one would not expect from the slow growth and rather circumscribed disease. In this form, according to v. Rüdiger, cures should be obtained in a certain number of cases. His patient remained well one year after excision. Garré's case is an example of a more extensive disease: the marrow cavity of the femur was invaded, and the patient died two months after amputation from multiple metastases. Some authorities look upon this case as a tumor primary in the medullary cavity of the femur with secondary involvement of the knee-joint. Clinically there was no evidence of the bone lesion which probably would have shown in the *x*-rays.

I have observed a large soft popliteal tumor, in which the knee-joint and bones appeared clinically uninvolved, yet the *x*-rays showed the primary medullary sarcoma of the lower end of the femur, and a study of the specimen, a small perforation of the bone, through which the popliteal tumor grew.

In a second case in v. Rüdiger's collection the patient died of metastasis, although there was no bone involvement. The ultimate result in the four remaining cases, including v. Rüdiger's, is either not given, or not

sufficiently remote from the operation to estimate the probability of a cure. v. Rüdiger is of the opinion that excision is justifiable.

TRAUMATIC ARTHRITIS. The splendid contribution of Bennett¹ on recurrent effusions in the knee-joint after injury should be compared with Schlesinger's² monograph on *hydrops articulorum intermittens*. Bennett's report is based upon 750 of his own observations. These he divides into two groups: (1) purely traumatic; (2) traumatic in individuals suffering with some form of arthritis or constitutional disease.

In the first group, in which there are 509 cases, no other etiological factor except the traumatism could be established; the degree of trauma varied, and the resultant effect upon the joint, in the majority of cases, had no relation to the severity of the trauma. In 428 of these cases, the diagnosis of internal derangement of the knee was made. However, in all of the cases of this group subjected to operation a loose semilunar cartilage, or a pedunculated joint body was found, the removal of which relieved the symptoms. A diagnosis of internal derangement of a knee-joint, is a very bad term. Practically in all of the cases there is an anatomical basis for the symptoms. In fifty-six cases, according to Bennett, the clinical picture was obscure, and in twelve at exploratory arthrotomy nothing was found to explain the recurrent effusion. In twenty-one cases free joint bodies were associated with the recurrent joint effusion; in sixteen of these cases the diagnosis was confirmed by the arthrotomy, and the symptoms relieved by the removal of the body. The static deformity, genu valgum, was the etiological factor of a hydrops in four patients: two subjected to osteotomy were relieved. Bennett concludes that in all cases of recurrent effusion after injury exploratory arthrotomy is indicated unless the condition is rapidly relieved by conservative methods.

In the second group of 241 cases Bennett found a joint or constitutional lesion in addition to the traumatism. The most frequent was osteoarthritis—107 cases. In twenty-eight of these in which free joint bodies were removed, excellent results were obtained; in other less pronounced cases improvement followed treatment with hot air, electricity, rest and massage. In thirty patients there were sufficient symptoms to conclude that either gout or rheumatism might be considered an additional factor. In two of these cases Bennett performed arthrotomy; the result, however, was no better than in two cases in which the effusion was simply aspirated. Forty-two patients with recurrent effusion into the knee-joint had other symptoms which allowed a diagnosis of syphilis, and for this reason only the antisyphilitic treatment was employed.

¹ *Lancet*, January 7, 1905; reviewed in *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 227.

² *PROGRESSIVE MEDICINE*, December, 1900, p. 195.

One is surprised that Bennett, in this very large group observed only twenty-eight cases of gonorrheal arthritis, in only one of which arthrotomy was employed, in another aspiration. In my experience, gonorrhea is one of the most frequent causes of intermittent hydrops. In the lighter cases the gonococcus is never present in the effusion. Aspiration is indicated simply for diagnostic purposes. The demonstration of the gonococcus is an indication for arthrotomy and irrigation. It is interesting to note that in eighteen cases the patients complaining of intermittent effusions from the knee-joint were suffering with malaria. Schlesinger recorded no observations of this kind, nor have I ever observed it, although until recent years malaria has been very common in Baltimore. In three of Bennett's cases there was hemophilia, in thirteen the patients were young girls of the neurotic type and suffering from menstrual disorders; hydrops was observed during the menstrual period and disappeared between menses. These cases may correspond to Schlesinger's idiopathic intermittent hydrops, which is very much like the acute circumscribed angioneurotic edema of Quincke. Bennett has apparently not observed recurrent effusion in tuberculosis, nor in the arthropathies of tabes and syringomyelia. In these lesions it is not infrequent.

As I have previously brought out in *PROGRESSIVE MEDICINE*, a patient suffering with intermittent effusion into a joint, with or without a history of trauma, should stimulate one to review the entire chapter of etiological possibilities. It may be the symptom of a very insignificant lesion, or the first sign of a very grave disease. This intermittent effusion was not observed in the cases of primary sarcoma of the synovial membrane which I have just discussed. In these cases the swelling, after it had first appeared, did not disappear, but in Zezas' case of cavernous angioma there was apparently an intermittent swelling in the early stages. Intermittent hydrops, it seems to me, might be a symptom of a benign joint tumor, as it is of a pedunculated or free joint body.

LOOSE JOINTS. Riedinger's¹ communication covers the possible etiological factors of this symptom of a joint lesion. Intermittent hydrops, just discussed, if the effusion is great enough, may lead to a permanent expansion of the capsule and a loose joint. Riedinger divides the etiological factors into traumatism, disease, and static. Traumatism is not an infrequent factor. In neglected cases, in which the joint capsule or ligaments are torn, permanent relaxation may follow. In any one disease which produces a marked effusion or change in the anatomical relation of the articulating bones, the use of the limb without support will lead to relaxation. Although not mentioned by Riedinger, the

¹ *Centralbl. f. Chir.*, 1906, vol. xxxiii, p. 694.

most marked examples of loose joints are seen in tabes and syringomyelia.

Here, on account of the absence of pain, the patients continue to use the limb until the relaxation up to dislocation prevents function. Among static factors the most important are fractures which have healed with some dislocating deformity, the curvatures in rickets, and flat-foot. As an etiological factor which may be classed under traumatism Riedinger speaks of improper extension of the leg with its effect upon the knee-joint, and advises that in extension the knee should be flexed and fixed with a plaster dressing. The most important feature in treatment is prevention. As long as any of the factors mentioned above are present the joint should be protected, and all operable lesions should be operated upon.

The monograph of Fessler,¹ which is an experimental investigation of the resistance of the joint ligaments to torsion, should be read in the original by those interested in the mechanics of joint injuries.

BULLET WOUNDS OF JOINTS. A splendid summary of 157 joint injuries was presented before the recent German Congress by a Russian surgeon, Bornhaupt.²

This experience confirms the present-day views on joint injuries. The per cent. of joint bullet wounds among Russians was larger than in the previous wars. The knee-joint is the most commonly affected. The majority of wounds were produced by a mantle bullet, and the per cent. of healings per primam after non-operative treatment was very much larger than in a smaller group of wounds inflicted by shrapnel and splinters. The probability of a good result is greatly increased if the bullet passes out through a wound of exit. The best results were observed in mantle wounds of the knee-joint, the worst in the ankle-joint. The most important point in treatment is an immediate aseptic dressing and careful transportation with the injured limb fixed in a splint. The majority of suppurations could be apparently explained either by the character of the injury or absence of, or faulty, technique in the first-aid-dressing or in transportation. Bornhaupt recommends an aspiration in all cases with effusion if there are any symptoms of infection. In his experience, if the joint is infected with streptococci, arthrotomy and irrigation must be performed within a very few days: if not, little can be expected from this drainage and amputation will be necessary, while in cases infected with staphylococcus he has observed good results from arthrotomy and irrigation after a longer interval. In his experience, a wide opening of the joint with gauze packing similar to the method

¹ Deutsch. Ztschr. f. Chir., 1906, vol. lxxxii, p. 1.

² Archiv. f. klin. Chir., 1906, vol. lxxxiii, p. 33; reviewed in Centralbl. f. Chir., 1906, vol. xxxiii, Supplement No. 28, p. 36.

recommended by Allen, which I will discuss later, has yielded better results than resection. Among the 157 joint injuries reported there were but seven deaths; in two the hip-joint was involved, in five the knee-joint. This experience, Bornhaupt states, favors conservative treatment. He also adds that he is of the opinion that in future wars Bier's passive hyperemia will be employed in infected joints to great advantage.

PYOGENIC ARTHRITIS. Under this heading one should include all joint inflammations in which bacteriological studies demonstrate the micro-organisms of suppuration. There may be a preceding trauma producing a traumatic arthritis with effusion, which later becomes infected through the blood, or there may be an open wound. In other cases trauma is not an etiological factor, but the bacteria reach the joints through the blood or lymph vessels from a near or remote zone of primary infection. In this group of cases it is very important to bear in mind that the joint symptoms may mask a focus of osteomyelitis. This is especially true in young children and early youth. Practically every joint effusion should be aspirated. The presence of bacteria in the aspirated fluid, with few exceptions, is an indication for immediate arthrotomy and irrigation. If this treatment is employed early in the onset of the disease, and the arthritis is not associated with osteomyelitis, immediate relief with future restoration of joint function should be expected. My personal experience with a large number of cases indorses this statement. The longer arthrotomy is delayed the worse the chances for restoration of joint function. In the few cases of arthritis associated with typhoid fever, in which the typhoid bacillus has been found in the effusion, good results have been obtained by simple aspiration. My colleague Dr. Cole, of the Johns Hopkins Hospital, informs me that they had one case of gonorrheal arthritis in which the gonococcus was found in the joint effusion and in which there was recovery with joint function without arthrotomy and irrigation. In every case of gonorrheal arthritis in which I have found the gonococcus in the effusion I have performed immediate arthrotomy and irrigation, and have had no experiences to regret. In a few instances the joints have recovered after aspiration when the pneumococcus was present in the effusion. With the exception of the typhoid bacillus in the effusion I believe that one should never rely upon aspiration alone. In previous numbers of *PROGRESSIVE MEDICINE* I have fully considered the subject of pyogenic arthritis, and in recent literature I find nothing of sufficient importance to justify a further consideration. The chief criticism to be made is that both physicians and surgeons procrastinate in the treatment and exploratory aspiration for bacteriologic-diagnostic purposes. Herzog¹ in reporting his observa-

¹ Jahrbüch. f. Kinderheilkunde, vol. xliii, No. 4.

tions of *pneumococcus arthritis* in children gives the entire literature up to date and remarks that the only effectual treatment is arthrotomy, and that if this is performed in time function is restored. The same subject is considered by Secretan and Wrangham.¹

The contribution by Allen and Alden,² of Cleveland, on a study of infections of the knee-joint and their treatment, illustrates the good results in advanced cases by the wide opening of the knee-joint and gauze packing. This experience is confirmed by Bornhaupt³ in bullet wounds. In the operation recommended by Allen the knee-joint is opened by a transverse incision dividing all the tissues beneath the patella. This exposes the joint, which is disinfected with pure carbolic acid followed by alcohol, and packed with gauze. Of course, after such treatment ankylosis takes place. In my own experience, I have resected those cases in which the infection had gone beyond the hope of restoring joint function by arthrotomy and irrigation. Especially in the knee-joint, in the cases which I have seen, the ankylosis after extensive drainage has left a stiff and painful knee. The recommendations of Allen and Bornhaupt should be borne in mind, because their method, if it yield good, immediate, and permanent results, involves a less serious operation than excision. The important fact, however, to bear in mind is, that if pyogenic arthritis is recognized in the early stage and arthrotomy performed, these extensive operations will become unnecessary, and joint function will be restored.

PYOGENIC ARTHRITIS OF FINGER-JOINTS. The chief point brought out by Rosenberger⁴ in his very interesting contribution is the importance of fixation of the finger during the treatment. After the arthrotomy of the infected joint a splint is applied with a window to allow frequent dressings. I have had too little experience with finger-joint suppurations to comment on his advice. However, my experience with other joint infections has demonstrated that fixation is not such an important factor. After the wound has healed, Rosenberger recommends the most energetic massage and passive motion. I have used passive motion before the wound has healed, both in small and large joints.

JOINT LESIONS OF HEMOPHILIA. Frölich⁵ recognizes three forms: acute, subacute, and chronic. From his clinical picture of the acute form it seems to me it would be difficult to differentiate it from acute articular rheumatism, but for the fact that in the acute hemophilic arthritis the patients are children and as a rule but few joints are involved; there is fever, the joints are swollen and painful, there may be ecchymosis; all

¹ British Medical Journal, April 21, 1906.

² Surgery, Gynecology and Obstetrics, July 1906, vol. iii, p. 1.

Loc. cit.

³ Centralbl. f. Chir., 1906, vol. xxxiii, Supplement No. 28, p. 120.

⁵ Ibid., 1905, vol. xxxii, pp. 222, 326

symptoms subside in ten days. The subacute form differs only in that the fever is less high, the local joint symptoms milder and of shorter degree. In the chronic form there are successive mild attacks. In the acute and subacute forms joint function is restored after the attack, while in the chronic type after each exacerbation more and more impairment of joint function is observed, until there is positive evidence of cartilage and joint destruction. The chronic type was first described by König, and, as the acute and subacute varieties may be confused with acute articular rheumatism, the chronic form is often mistaken for tuberculosis. In one of Frölich's cases the clinical picture was so like an acute osteomyelitis of the upper end of the femur that an operation was performed and the patient died of hemorrhage. How one is to differentiate in the absence of a typical bleeder's history Frölich does not give any aid. He also records an interesting case of König's chronic form, in which a resection of the knee-joint gave a good result, confirming König's conclusion that in the later stages of the chronic form there is no danger from resection.

Zezas¹ calls attention to bleeders' joints. In his experience, the affection involves more than one joint, there is no reaction to tuberculin, and loss of function is only observed in the chronic form. The French have contributed most of the literature to this subject.

I have never observed a case of hemophilic arthritis.

NEUROPATHIC ARTHRITIS. Zezas² recent monograph on the joint lesions of syringomyelia does not add anything new to the clinical picture or pathological anatomy of this disease, which were discussed in *PROGRESSIVE MEDICINE* for December, 1900, in a review of Schlesinger's monograph. Zezas is interested chiefly in the so-called habitual shoulder-joint dislocation which, in his experience, may frequently be the first symptom of syringomyelia—a point which was commented upon in 1900. Conservative measures are indicated in this arthropathy. The disabled joint should be supported.

There is very little difference between the clinical picture and pathological anatomy in the joint lesion of syringomyelia and those associated with posterior sclerosis.

Blencke³ not only reviews the literature but adds a number of instructive Röntgen pictures and illustrations of the pathological anatomy.

In a later communication by Blencke⁴ he discusses the views of Ritter and Budinger who claim that both in arthritis deformans and tabetic arthritis there is a degeneration of the peripheral nerves. Blencke is of the opinion that there is no evidence to confirm this view.

¹ *Centralbl. f. Chir.*, 1906, vol. xxxiii, p. 71.

² *Deutsch. Ztschr. f. Chir.*, 1905, vol. lxxx, p. 165.

³ *Ztschr. f. orthoped. Chir.*, 1904, vol. xii, p. 632.

⁴ *Ibid.*, 1905, vol. xiii, p. 653.

To one interested in joint arthropathies I would call attention to the monograph of Borchard,¹ chiefly on account of the numerous x-ray studies of the diseased joints. Lüders² adds six further cases to the nineteen reported by Borchard, with excellent photographs and x-ray pictures of the joint.

From the standpoint of practical surgery, the joint lesions of tabes and syringomyelia are chiefly of interest when they appear as the first symptom of the spinal lesion. In the differential diagnosis of all chronic arthritides these diseases should constantly be borne in mind.

GOUTY ARTHRITIS. The irritation in this variety of arthritis is due to deposits of urate of soda. The arthritis in gout rarely becomes a surgical lesion; unless there be a positive indication, all operative interventions are harmful, as they may lead to secondary infections of tissues the resistance of which is lowered by the presence of these deposits. Læwen³ in a communication entitled "Joint Suppurations in Gout," emphasizes the experience of years, that primary suppuration in gouty arthritis practically never occurs. Now and then, usually in improperly treated cases, the tophi are so near the skin that pressure atrophy of the latter with perforation may take place, after which event secondary pyogenic infections may set in. In such cases operative intervention is indicated. He reports a few cases, in all of which the lesion involved the joint of the great toe. Excision of the joint was successful in one, and amputation of the toe necessary in another.

Very frequently, in the acute arthritis of gout, especially when confined to the region of the great toe, the local symptoms—redness, swelling, and pain—are even more marked than in a joint suppuration, but the general symptoms, fever and especially leukocytosis, are absent. It is remarkable how rapidly these local symptoms subside after rest, proper diet, and therapeutic measures. Moser⁴ has observed good results in gout and rheumatism after x-ray exposures. In gout the first exposure should be of short duration, in rheumatism it may be longer. He has observed relief from pain and a more rapid absorption of the exudate. It has no effect as a preventive of further attacks.

ACUTE ARTICULAR RHEUMATISM. In the various contributions to the literature which I have read during the year none have concerned themselves exclusively with this variety of joint disease. It is mentioned only in differential diagnosis. Any critical review, however, would be incomplete without reference to this "specific" arthritis, the etiology of which is still obscure. As has been previously discussed in *PROGRES-*

¹ Deutsch. Ztschr. f. Chir., 1904, vol. lxxii, p. 514.

² Ibid., 1906, vol. lxxxiii, p. 1905.

³ Beiträge zur klin. Chir., 1906, vol. 1, p. 571

⁴ Centralbl. f. Chir., 1905, vol. xxxii, p. 1297.

SIVE MEDICINE, and as I again find emphasized in recent literature, acute articular rheumatism must be looked upon as a distinct and isolated form of polyarthritis. Up to the present time bacteriological investigation has been negative as to the presence of micro-organisms. When found, expert bacteriologists look upon them as secondary invaders, or due to faulty technique of the investigator. Acute articular rheumatism has a pretty definite clinical picture. The most important fact is that both the febrile period and the time of the joint involvement are limited. The exact minimum and maximum have not been established, but if the joint swellings and the fever do not subside within two or three weeks one should become suspicious that the lesion is not rheumatism. In this disease also, after the attack, there should be complete restoration of the function of the joint. This has been my experience. Surgery is contraindicated. When the intra-articular effusion is great, aspiration should be done to exclude the presence of micro-organisms.

ARTHRITIS DEFORMANS. In this group many forms of chronic non-tuberculous arthritis are placed. The diagnosis is made by exclusion of the lesions which we have just discussed. At the present time we have no data for or against the possibility of a common etiological factor. It is quite possible that there are different factors which produce the identical pathological changes. This group is the most difficult to discuss. Its importance is due to its common occurrence, the pathetic resultant deformities and to our present inability to accomplish much for the relief of these patients. Recent experience suggests that if it is recognized in its early stage much can be done for the prevention, or, at least, lessening of the progressive joint deformities and ankyloses. Berger¹ attempts, in describing a case, to isolate a form and calls it an obscure form of ankylosing affection—a progressive disease. It seems to me, however, that it represents simply a pathological type in which there is rapid destruction of the cartilage with complete bony ankylosis, in which the lamellar system of the adjacent bones soon communicate with each other—a type which Janssen has described in the hip, and illustrated in *PROGRESSIVE MEDICINE*, December, 1904, p. 236, Fig. 78.

Hesse² illustrates what he calls bilateral idiopathic juvenile osteoarthritis deformans of the hip-joint. This is a well-recognized type, in which only one or both hip-joints are involved. I have personally observed six such cases, and was suspicious in every one of them that the gonococcus was the etiological factor. Richardson³ contributes a very interesting clinical report of seventy-five cases of what he calls chronic non-tuberculous arthritis. It is interesting to note that in sixteen of his

¹ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 901.

² *Mittheilungen a. d. Grenzgeb. der Med. u. Chir.*, 1905, vol. xv, p. 345.

³ *Centralbl. f. Chir.*, 1905, vol. xxxii, p. 1314.

cases the onset was acute, and the picture resembled acute articular rheumatism. It differs clinically from the latter in that the pulse is higher than the temperature and that the joint symptoms never completely subside. The paper of Anders, Daland, and Pfahler¹ is concerned chiefly with the x-ray treatment of *arthritis deformans*, suggestions for which they credit Moser,² to whom I have referred. Their experience leads them to view the Röntgen rays as a valuable adjunct to other well-recognized therapeutic measures which should not be neglected. Nathan³ in his discussion is interested chiefly in the classification of rheumatoid arthritis. He recognizes a metabolic joint disease, either of arteriosclerotic or autotoxic origin, and an infectious polyarthritis. He comes to these conclusions after a careful study of two hundred cases. Sayer,⁴ of New York, is interested chiefly in a very brief article, in the mechanical treatment of non-tuberculous joint inflammations, and is of the opinion that rest and protection play a most important part, and there should be no exceptions to this rule. The experience of other authorities and my own contradict Sayer's view.

CONCLUSIONS IN REGARD TO THE CLASSIFICATION AND TREATMENT OF DISEASES OF THE JOINTS. From my own experience and the reading of the literature, and from the pathological and bacteriological studies of cases which have come to operation, I have been able to formulate a somewhat definite scheme for the purpose of instruction. I would first divide all joint diseases in two great groups—tuberculous and non-tuberculous arthritis. In tuberculosis we bear in mind both the lesion of the soft parts and of the bone; we are greatly aided in our diagnosis by the local reaction to tuberculin, and, in the scheme of therapy, the general treatment is as important as the local. These patients should always receive the modern fresh-air environments. The better the circumstances of the patient the more ideal can be the climatic change, but all of these patients can be kept out-of-doors, no matter what class they belong to. In the local treatment there is a definite operative and non-operative group, which I will discuss later when I consider tuberculosis of the bones and joints. In tuberculosis Bier's obstructive hyperemia in all cases, combined with the suction bell (cup) when the lesion is complicated with fistulæ, has become a well-recognized therapeutic measure. The majority of authorities now are inclined to use immobilization of the affected joint for a shorter duration and to allow later on more freedom of motion combined with passive motion and massage.

In non-tuberculous joint lesions we must recognize the following

¹ Jour. Amer. Med. Assoc., May 19, 1906, vol. xlv, p. 1512.

² Loc. cit.

³ Amer. Jour. Med. Sci., January, 1906, vol. cxxxi, p. 55.

⁴ Amer. Jour. Orthop. Surg., April 1906, vol. iii, p. 346.

groups: gout, acute articular rheumatism, syphilis, pyogenic arthritis, the most common of which is due to gonorrhea; traumatic arthritis; the joint lesions of scurvy, hemophilia and purpura; the neuropathies and the major group which at the present time is called arthritis deformans.

Gout, acute articular rheumatism, the lesions of scurvy, hemophilia, and pupura are distinctly non-operative forms. In this group intervention may be harmful. In gout the perforation of a tophus with secondary infection would require surgical intervention. In acute articular rheumatism secondary pyogenic infection is unusual; aspiration for bacteriological examination is indicated if the effusion is excessive, or the leukocytosis above 15,000 to 18,000. In all cases with a clinical picture like acute articular rheumatism, and in which joint resolution is not rapid and complete, be suspicious of gonorrhea, or the acute form of arthritis deformans. In many cases of syphilis the joint lesion is so combined with other signs of the disease that the diagnosis is not difficult. Operation is rarely indicated, except in doubtful cases and for diagnostic purposes. The joint lesions of syphilis which lead to impairment of function are infrequent. The presence of bacteria in the joint effusion places the arthritis at once in the pyogenic class, whether the infection be primary or secondary, and immediate arthrotomy and irrigation are indicated. In late cases, in which the appearances after opening the joint indicate that recovery is possible only with ankylosis the method advocated by Allen for the knee-joint should be employed. In the knee, elbow, and shoulder, and, perhaps, the hip this extensive packing with gauze is possible; in the ankle and wrist, excision should be performed. It is of the utmost importance in all cases of pyogenic arthritis not due to the gonococcus or secondary to an open wound, to bear in mind the possibility of a focus of osteomyelitis in a neighboring bone. The recognition and treatment of traumatic arthritis with its manifold possibilities cannot be summarized in a few words. In past numbers of *PROGRESSIVE MEDICINE* this has been considered with great detail. However, as experience grows, more and more of these cases are selected from the very large group and relieved by simple operative procedure. It is very important to recollect that a slight injury of the cartilage or ligament, or some distortion which gives rise to constant traumatism, may in time produce a traumatic arthritis deformans with complete destruction of joint function. This pathetic result can be prevented by recognition and treatment. Patients suffering with joint lesions in syringomyelia and tabes should at once be given the benefit of orthopedic apparatus. This support and protection usually prevent the extensive joint changes seen in neglected cases. Operation is rarely indicated, and the results of resection entered into enthusiastically some years ago discourage rather than encourage their further practice.

The treatment of the major group embraced under the name of arthritis deformans varies with the stage of the disease and the pathological changes in the joint. What our results are to be, when treatment is instituted in the early stage, is, at the present time, impossible to state. Apparently there is a type in which the disease is progressive in spite of treatment. These patients require a careful regulation of diet. In the hygienic safeguards they should avoid exposure to cold by wearing flannel or silk. Bathing with massage of the skin should be practised twice a day. In the acute exacerbations the pain enforces rest, but as quickly as possible after such attacks, massage and passive motion should be resumed. In Bier's hyperemia, dry superheated air should be employed. My experience with the results of treatment in sanatoria, designed especially for such joint lesions, is not sufficient to conclude that they are any better if the same treatment can be followed out in a simpler manner at home or in a general hospital. Rest and immobilization should be avoided.

In a few cases which I have seen in the early stage apparently good results have followed arthrotomy and irrigation. In these cases the pathological changes consisted of a very vascular synovial membrane and a joint effusion. The best operative results, with restoration of function, are observed in the group in which more or less villous hypertrophy was present. These villi should be excised, and the joint wound closed.

When the arthritis has reached the stage in which the synovial membrane is replaced by connective tissue and more or less destruction of cartilage (*arthritis fibrosa*), or with the formation of new periosteal bone in the region of the joint (*osteoarthritis*) there is little hope to restore joint function by any means. In these cases resection is indicated. At the present time surgeons are attempting clinically and experimentally to ascertain if joint function can be restored in ankylosed joints of a lesser degree by the interposition of muscle, tendon, or transplanted cartilage or periosteum.

Schüller's classification of arthritis will be found in the August number of the *American Journal of the Medical Sciences*, 1906, p. 233.

Tuberculosis of Bones and Joints. This subject was introduced in PROGRESSIVE MEDICINE for December, 1899, and most extensively considered in 1900, reviewing at that time chiefly Krause's work, which appeared as a volume of the *Deutsche Chirurgie*. For a few years nothing of especial interest appeared in the literature. During the last two years there have been numerous contributions, and the subject has been attacked with renewed enthusiasm and vigor.

In the surgical section of the National Association for the Study and Prevention of Tuberculosis the treatment of tuberculosis of the bones

and joints was presented by Goldthwait, of Boston, and followed by an extensive discussion. In the recent meeting of the first Congress of the International Surgical Society,¹ held in Brussels, September, 1905, there was an unusually instructive discussion. In the recent German Surgical Congress² tuberculosis was considered chiefly with other joint lesions in relation to Bier's conservative treatment with passive hyperemia and cupping.

To summarize the important points, I will take the liberty of introducing my discussion of Dr. Goldthwait's paper which I have just mentioned.

The paramount object of treatment is the cure of the disease with complete function of the joint. The latter is the most difficult to attain.

The three factors in treatment are: local rest of the diseased part, surgical intervention in selected cases, and the general hygienic treatment of the patient.

To accomplish a cure with restoration of function depends more upon early recognition of the disease than any other factor. The public, therefore, must be educated to know the early symptoms which suggest a lesion of the bone or joint.

When the general practitioner sees these patients in this earlier stage he must be keen in the differential diagnosis.

A course of treatment appropriate for tuberculosis is inappropriate, and frequently harmful, for other lesions.

The tuberculin test and the x -rays should be considered essential in the diagnosis.

Both in children and adults the diagnosis of inflammatory rheumatism is too often incorrectly made.

The possibility of a gonorrheal arthritis, of pyogenic osteomyelitis, a bone tumor, syphilis, and the early stage of arthritis deformans (acute or chronic non-tuberculous arthritis) should always be carefully considered.

The paramount factor at the outset of treatment is diagnosis. One reaches the conclusion as to a diagnosis of tuberculosis in various ways, according to the stage of the disease. The tuberculin test, the x -rays, and other factors which allow an exclusion of other diseases must all be employed.

If there be any doubt as to the nature of the lesion, and if the symptom-complex suggest the possibility of any of those lesions for which early surgical intervention is best suited, an exploratory incision is justifiable.

In many instances precious time is lost because of an incorrect diagnosis of a form of tuberculosis in which non-operative treatment is indicated.

¹ Centralbl. f. Chir., 1905, vol. xxxii, p. 1305.

² Ibid., 1906, vol. xxxiii, No. 28.

The more one inclines to the non-operative treatment of tuberculosis the more exact should be the methods of diagnosis.

I agree with Dr. Goldthwait that, especially in children, and in the early stages of the tuberculous lesion, equally good results are obtained by non-operative treatment, and I further agree with him that the fixation of the affected joint should be modified toward allowing some motion, varying in different stages of the disease.

In all forms of tuberculosis the open air or hygienic treatment is usually incomplete.

In the local treatment the time is usually made too short. It is most important to impress the public and the general profession that both local and general treatment should be continued months and perhaps years after all symptoms have disappeared.

These patients, whether children or adults, should be instructed in a mode of life which will protect them from future recurrences. The affected limb should always be considered one in need of protection, and the patient should be cautioned to continue as far as possible the hygienic life lead during the active stage of the disease.

The indications for surgical intervention in tuberculosis of the bones and joints are manifold. They vary with the age of the patient, the duration of the disease, the pathological extent of the local lesion, and the joint involved.

One cannot read Bier's numerous communications and recent reports by others on the employment of hyperemia without the conclusion that this method has not been given proper consideration in this country.

A long personal experience and the reading of the literature make me skeptical as to the value of the various joint injections, for example, iodoform.

In children, experience contraindicates operation in all stages.

If, however, the local lesion is progressing and one feels that operative intervention promises a restriction of the diseases and an ultimate better function of the joint there should be no delay.

In adults the opposite is true. If the indications suggest that in the ultimate cure the joint will be ankylosed, time, valuable to the individual, is saved by excision of the joint. The functional results of such an excision in the ankle, wrist, elbow, and shoulder are excellent, and the functional results in my experience of the non-operative treatment are so poor, that I am inclined to early excision in the majority of cases.

When there is an abscess my experience indicates that better results are obtained by the direct attack of the bone focus than by any treatment of the abscess itself.

If the *x*-rays show a large tuberculous focus in children or adults,

better results are obtained by operative intervention. These cases are infrequent.

If the clinical history indicates a rupture of a bone focus into a joint previously unaffected, immediate operation is indicated. The joint should be washed out, and the bone focus exposed. I have had such cases with perfect restoration of function.

If a diagnosis of primary tuberculous synovitis can be made, I believe arthrotomy and irrigation are indicated, especially in the knee-joint.

THE OPEN-AIR TREATMENT OF SURGICAL TUBERCULOSIS. It is very interesting to note that among the many surgeons who spoke on this subject in the first Congress of the International Surgical Society only three emphasized the importance of open-air treatment: Bradford of Boston, Hingston of Montreal, and one German surgeon, Hoffa. I believe the credit for this most important adjunct should be given to America, and one should read the paper presented by W. S. Halsted at the first annual meeting of the National Association for the Study and Prevention of Tuberculosis.¹ When I came to Baltimore, in 1892, I found that the patients suffering with tuberculosis in Dr. Halsted's wards were all receiving the open-air treatment, and those who could afford the expense were advised to go to the Adirondacks.

Goldthwait,² in his introduction, says that the treatment of tuberculosis of bones and joints is a subject of such magnitude that in a single paper it is impossible to more than mention the essential features which should be the basis of all treatment. Tuberculosis of bones and joints does not differ from that of any other tissue, except in the associated osseous and synovial changes. The general principles of treatment are the same. In the discussion of the pathology, Goldthwait emphasizes that a knowledge, especially of the grosser pathology, is essential in considering the problems of treatment. He calls attention to the fact that tuberculosis may be primary in the synovial membrane with secondary involvement of bone, as well as the reverse. The difficulty of treatment lies in determining the limitation of the tuberculous process and the local possibilities of repair. He describes what he calls the pathologically hopeless joint, in which restoration of function cannot be expected, and for which excision must be performed, and the more favorable pathological picture in which restoration of function can be expected. In the majority of cases, when the disease has not reached a pathologically hopeless state, conservative treatment should be followed. For the general condition of the patient, open air is the most important feature; as to local measures, rest and support of the affected joint; complete immobilization should only be employed during the acute stage. Early operations are indicated when

¹ American Medicine, December 2, 1905, vol. x.

² Loc. cit.

the *x*-rays show a single large bone focus. Goldthwait prefers to aspirate the tuberculous abscess and postpone incision until appropriate treatment demonstrates that the abscess is increasing. He does not mention Bier's methods.

Kocher in a few sentences covers the more important problems, when he states that the indications vary with the joint involved and the number and size of the bone foci. He also advocates in early synovial tuberculosis of the hip-joint arthrotomy, disinfection with pure carbolic and closure of the wound.

Lewiasch¹ presents a very interesting statistical study, with ultimate results, of 100 cases of tuberculosis of the hip treated in Kocher's clinic from 1870 to 1896. The end results were obtained in 70 cases, 23 of which died—4 in the clinic and 19 later. Of these at least 10 died of tuberculosis: 4 of the lung, 4 of tuberculous meningitis. Of the 47 living cases 27 can be considered well, 30 improved, and 6 not improved. In 21 cases there was good motion at the hip, in 7 complete ankylosis. The position was bad in 10 cases. These results can be considered examples of the possibilities of conservative treatment, but, as Lewiasch states, the results of more recent years are undoubtedly better.

Krämer² uses the tuberculin test in estimating the after-treatment of surgical tuberculosis. Until the patients cease to react to tuberculin locally and generally, treatment should be continued, the most important feature of which is open air.

OPERATIVE TREATMENT OF TUBERCULOSIS. On this extensive subject I can only mention briefly the most important literature, which should be read in the original by those interested in the operative details. Durante³ is one of the few who still employ extensively injections of iodine into the joint. In all recent communications one is impressed that the former enthusiasm for iodoform and other injections into the joint is on the decline. Bier uses iodoform only in extensive joint hydrops or purulent collection in the synovial capsule of the knee-joint. In the Johns Hopkins Hospital we have practically given up iodoform injections.

Bardenheuer,⁴ v. Mosetig-Moorhof,⁵ Lorenz and Reiner⁶ describe in detail the radical operation for the extensive involvement of the upper end of the femur and acetabulum in tuberculosis and osteomyelitis, and advocate rather early intervention. Bardenheuer explores the acetabular cavity from within the pelvis to demonstrate if there has been

¹ Deutsche. Ztschr. f. Chir., 1906, vol. lxxxii, p. 245.

² Ibid., 1905, vol. lxxix, p. 565.

³ Centralbl. f. Chir., 1906, vol. xxxiii, p. 38.

⁴ Ibid., 1905, vol. xxxii, p. 20.

⁵ Wiener klin. Woch., 1905, No. 30.

⁶ Ibid., No. 15.

a perforation—a very important procedure in some few very advanced cases. It is very difficult to decide when to operate in tuberculosis of the hip. In children it is less frequently indicated, in adults the mistake is often made on the conservative side. In the operative cases there are two groups. In one there is a single focus which can be removed with restoration of function. These cases I¹ have considered. Huntington² advocates early operative treatment in selected cases in which he trephines through the trochanter into the head of the femur. In the second group the disease is more extensive and, especially in adults, demands more radical treatment. The operative treatment of large joints, especially resection, is fully considered by Wolkowitch³ and Draudt,⁴ while Stich⁵ and Hofmann⁶ confine their communications to the operative treatment of tuberculosis of the ankle.

CONCLUSIONS IN REGARD TO TREATMENT OF TUBERCULOSIS OF BONES AND JOINTS. I believe, if these patients come to treatment in the early stage, that open air combined with Bier's hyperemia and proper orthopedic apparatus will accomplish an ultimate cure in an increasing proportion of cases, and operations will be performed, relatively, less frequently. Every case should be subjected to *x*-ray study, and the cases in which early intervention is indicated, on account of a single bone focus, will be recognized. Patients first seen with fistulæ should be given the benefit of Bier's hyperemia and suction bells, before operative intervention is attempted. Immobilization and absolute rest in bed should only be employed, combined with open air, for a short time during the acute stage. If the acute symptoms do not rapidly subside under this treatment operation is indicated. It is my experience that arthrotomy and irrigation of the joint should be performed in those rare cases in which a bone focus suddenly breaks into a healthy joint. Clinically this can be recognized by the acute symptoms, the rapid effusion, and the *x*-rays. In adults when the patient comes under observation with a pathologically hopeless joint as described by Goldthwait, time is saved by early excision. In a very few instances, in which the life of the patient is jeopardized by the extent of the local disease, usually due to secondary infection, amputation may have to be performed. One, however, should try the open-air treatment and the open local wound treatment as long as possible. Now and then both life and limb will be saved. I have an illustrative case. In May, 1905, a boy aged twenty came under my observation, with tuberculous synovitis of the left knee. The local

¹ Johns Hopkins Hospital Bulletin, January, 1900.

² Surgery, Gynecology and Obstetrics, April, 1906, vol. ii, p. 406.

³ Deutsch. Ztschr. f. Chir., 1904, vol. lxxiv, p. 493.

⁴ Beitr. zur klin. Chir., 1905, vol. xlvii, p. 737

⁵ Ibid., vol. xlv, p. 587.

⁶ Ibid., vol. xlvi, p. 575.

symptoms had been present five months and had been associated with great loss of weight and strength. The knee presented the typical doughy swelling of Krause's tuberculous synovitis granulosa. He reacted to tuberculin. For two weeks he was placed out-of-doors in bed; he continued to have some temperature, did not gain strength or weight, and the local swelling increased. The *x*-rays showed no bone involvement. At the first operation (May 15, 1905) I attempted to preserve function by a partial excision of the tuberculous synovial membrane with disinfection with pure carbolic acid, followed by iodoform and closure of the wound—a method employed by Kocher in the hip-joint. The pathological condition in this knee is the one in which Bier states that he has observed little or no results from his hyperemic treatment. The improvement after the first operation was slight, if any. For this reason, six weeks later, resection was performed. There was as yet no bone involvement, but extensive tuberculous infiltration of the soft parts. Practically all of this could be removed in the dissection except a mass of granulation tissue surrounding the popliteal artery. This area was drained posteriorly with gauze. After this operation the patient continued to sleep out-of-doors. Bony union took place rapidly. Numerous gravitation abscesses formed between the muscles in the leg, which were opened as they were recognized—five incisions altogether. The patient continued to have fever and did not gain in weight. By the first of September, two months after the second operation, it was a question whether amputation would not have to be performed. Coincident with the cooler weather of the fall the patient gradually began to improve. He left the hospital in December, 1905, having gained sixty pounds in weight, sinuses all healed. Up to the present time he continues in perfect health, but lives in the open air. This result was accomplished in a general hospital and in the low altitude in Baltimore. In reviewing this case I believe it was a mistake not to have performed resection at the first operation.

JOINT RHEUMATISM OF TUBERCULOUS ORIGIN. Poncet and Leriche¹ and Mohr² describe a polyarthritis leading to progressive changes in many joints and fibrous or bony ankylosis. From their description they use the term rheumatism not in the sense of acute articular rheumatism, but to describe the chronic polyarthritis so frequently called rheumatoid, for which now the term arthritis deformans is more commonly employed. That is, the lesion they are describing is a form of tuberculosis having a clinical picture somewhat like that in arthritis deformans. Mohr calls attention to a monoarticular and polyarticular form. One sees more of this variety discussed in French literature.

It has been my experience that arthritis deformans in the past has been diagnosed tuberculosis more frequently than the reverse.

¹ *Revue de Chir., an. xxv, No. 1.*

² *Berliner Klinik, 1905, 2. Heft. 197.*

TUBERCULOSIS OF THE DIAPHYSES OF THE LONG PIPE BONES. Since my discussion of Küttner's¹ communication two very extensive articles have appeared. Friedländer² gives twenty-six excellent illustrations of the pathological findings and two plates of *x*-ray studies. The most recent communication with all the literature since Küttner's article is presented by Zumsteg³ from v. Bruns' clinic in Tübingen. There are two very instructive *x*-rays. Fig. 28 shows a focus in the shaft of the lower third of the ulna, and Fig. 29 a rather extensive area of disease in the lower end of the humerus.

FIG. 28

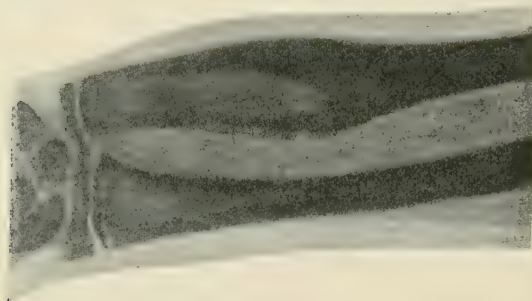


FIG. 29



Primary foci in the shaft of the long pipe bones without joint involvement are rare. In the differential clinical diagnosis and from the *x*-rays one will find some difficulty in excluding a bone cyst, a chronic pyogenic osteomyelitis, or a primary medullary sarcoma. I believe, in this form of tuberculosis, not only because of the difficulty of excluding some other medullary lesion, but from the standpoint of treatment, operation is indicated. At the exploratory incision there should be no difficulty

¹ PROGRESSIVE MEDICINE, December, 1899, p. 193.

² Deutsch. Ztschr. f. Chir., 1904, vol. lxxiii, p. 249.

³ Beitr. zur klin. Chir., 1906, vol. l, p. 229.

in recognizing the tuberculous osteomyelitis. As a rule there is a large caseous focus in the narrow cavity. The more recent communications since Küttner's add very little to the clinical picture and the pathology established by him. The new material, however, demonstrates that we should bear in mind this possibility in bone tuberculosis. Confirming Lexer's conclusions from his studies of the arterial supply of bone, metaphyseal foci are more frequent than diaphyseal. In v. Bruns' clinic, among 987 cases of tuberculosis of the joints, nine, or almost 1 per cent., have been examples of primary diaphyseal tuberculosis. The average age is between two and sixteen, the oldest patient was thirty-three. The foci are frequently multiple with evidence of tuberculosis elsewhere. In only three, or one-third of the cases, single foci were present in the bone without other evidence of tuberculosis. The development of the disease has varied from three months to three years; pain is not a prominent symptom; the patients first observe swelling, which gradually increases; following the formation of a cloaca in the cortical bone, the soft parts become involved, an extraosseous cold abscess develops which later ruptures spontaneously. The diagnosis in this stage is not difficult. In a few cases there is more local pain and tenderness, suggesting subacute pyogenic osteomyelitis. All authorities advocate early operation.

THERAPEUTIC REFERENDUM.

By H. R. M. LANDIS, M.D.

ALTHOUGH nothing especially new has appeared during the past year there have been many valuable suggestions in the treatment of disease. For the most part the contributors of articles on treatment have confined themselves to emphasizing the importance of methods already known.

It is manifest from the numerous contributions relating to diet and fresh air that the value of these measures is steadily gaining in importance.

It has now been established beyond a reasonable doubt that in tetanus antitoxin we possess a certain means of preventing tetanus and that this serum should be used after all wounds in which there is any possibility of tetanus developing. In regard to the other sera there has been no material change, although from the preliminary reports of Rogers and Beebe antithyroidin promises well.

To those interested in the specific treatment of tuberculosis the recent communications of Trudeau, Pottenger, and others should prove of great value. Many useful suggestions have been made concerning drugs. Concerning drugs Shattuck¹ has the following to say: Do no harm; try to see as clearly as possible why a drug is given, whether as a specific, a curative, a palliative or as a placebo; as a rule give a drug uncombined, this, however, is subject to many exceptions; in every case be as sure as you can that the drug is a good preparation, and then give it for its full physiological effect or until the evidences of an untoward effect appears.

Acetanilid. So much has been written within the past two or three years on acetanilid poisoning and the danger of "headache powders" that it hardly seems necessary to call attention to the fact that many proprietary and patent preparations are capable of producing very serious symptoms. Cases of poisoning due to "headache powders" have been reported by Blackburn² and by Austin and Larrabee.³ In addition there will be found an account of deaths produced by "headache powders" in the *Journal of the American Medical Association*. A not unusual case of acetanilid poisoning has been recorded by Herrick and Irons.⁴ In their case marked symptoms of poisoning were produced by absorption

¹ Boston Med. and Surg. Jour., March 29, 1906.

² Jour. Amer. Med. Assoc., June 9, 1906.

³ Ibid., June 2, 1906.

⁴ Ibid., February 10, 1906.

through the local application of the drug. Since the publication of their case Goepp¹ has added another. Herrick and Irons believe that acetanilid poisoning is to be suspected in a case presenting secondary anemia with cyanosis, dyspnea, nervousness, and gastrointestinal symptoms, without an adequate explanation for them in the heart, lungs, or other organs. The spleen may be enlarged. The urine is usually dark in color and becomes still more so on standing.

Adrenalin. The important questions of dosage and the after-effects of adrenalin on man are still unsettled. That doses by mouth far in excess of what was thought to be within the limits of safety, can be given without any immediate serious effects, has recently been demonstrated by Francine, who tells me that he gave a drachm of the 1 to 1000 adrenalin chloride solution every hour for four or five doses in a case of obstinate *hemoptysis*. It is doubtful if the full effect of the adrenalin is obtained in giving it by mouth, which may account for the safety of these large doses. W. S. Johnson² had a most alarming experience following the injection of a small quantity of a 1 to 4000 solution of adrenalin into the urethra to prevent a slight hemorrhage following the passage of a bougie, but urethral injections are often followed by untoward effects.

In regard to the possibility of *arteriosclerosis* developing after the use of adrenalin we have no information, so far as man is concerned, but there is strong evidence at hand from the experimental side. In addition to the data mentioned last year, several more studies have been published on the production of experimental arteriosclerosis in rabbits by means of adrenalin chloride. Pearce and Stanton,³ by injecting three minims of a 1 to 1000 solution of adrenalin every other day, obtained sclerotic areas in the aorta and small aneurysmal bulgings, due to degenerative changes and calcification in the smooth muscular fibers of the media. Nearly similar results have been obtained by Klotz.⁴ The mechanism of these changes is still obscure although it is believed that a toxic effect is the true explanation. Pyrocatechin, a product of the adrenal gland, was used by Loeb and Githens,⁵ who found that while this substance increased the blood pressure it had little or no effect in producing sclerosis of the vessel walls.

From a study of the literature, Ellis⁶ arrives at the conclusion that much caution is still necessary in the use of adrenalin. I think it is extremely doubtful whether a few doses of adrenalin will have any serious effect on the bloodvessels, but in the light of our present knowledge its continued use is at best very unwise.

¹ Jour. Amer. Med. Assoc., August 4, 1906.

² Ibid., October 7, 1905.

³ Journal Experimental Medicine, 1906, viii.

⁴ Ibid., 1906, viii.

⁵ Amer. Jour. Med. Sci., October, 1905.

⁶ American Medicine, February 24, 1906.

Equally interesting experimental studies have been made by Koranyi,¹ who has found that the simultaneous injection of iodine will prevent adrenalin arteriosclerosis in rabbits. A similar study has been made by Cummins and Stout,² who used iodide of potassium for this purpose. Pruszyński,³ in an experimental study, found that *blood pressure* was raised by adrenalin not only through its action on the bloodvessels, but also by reason of an increased action of the heart. Maragliano,⁴ from experiments on dogs and rabbits found that the injection of adrenalin, with moderately virulent staphylococci, greatly increased the virulence of the germs. He cites a case in which a solution of cocaine and adrenalin was injected for perialveolitis. This was followed by necrosis of the soft parts about the site of injection and fatal pyemia. Maragliano concludes from this and similar observations, as well as experimental research, that the injection of adrenalin into any but sound tissues is dangerous. I have previously called attention to the danger of sloughs forming after subcutaneous adrenalin injections, because of diminished local resistance.

Emery Marvel⁵ reports good results from the use of adrenalin in *abdominal surgery*. The conditions in which he recommends it are for the prevention of oozing where old adhesions have been separated, the prevention or limitation of adhesions from forming after acute exudative peritonitis, and the prevention of reformation after old adhesions have been separated. His method is to dilute 1 fluidrachm of adrenalin with 1 to 2 pints of warm normal salt solution and allow it to be absorbed by the peritoneal surfaces. The dilution is made in order to modify the action of the drug and prolong its effect. Marvel has followed this plan in twenty-eight cases and concludes, from his observations, that adrenalin can be safely used in the peritoneal cavity; that it controls peritoneal oozing; and that it prevents the formation of peritoneal adhesions. Furthermore, when shock or depression exist while the peritoneum is open, the local application of the adrenalin offers a more convenient and effectual means of treatment than by intravenous infusion.

Eliot⁶ used adrenalin (1 to 1000) in four cases of hemorrhagic small-pox. The results were not encouraging.

McCausland⁷ reports a case of obstinate *nasal hemorrhage* which he controlled by injecting 10 drops of a 1 to 2000 adrenalin solution into the upper lip. The site selected was on a line with the centre of the nostril from which the blood came. He refers to three similar cases reported

¹ Deut. med. Woch., April 26, 1906.

² Univ. Penna. Med. Bull., July, 1906.

³ Medicine, December, 1905.

⁴ Gazette degli Ospedali; Jour. Amer. Med. Assoc., May 12, 1906, p. 1485.

⁵ Therapeutic Gazette, June 15, 1906.

⁶ Washington Med. Annals, March, 1906.

⁷ Amer. Med., March 24, 1906.

previously by Mulford. Additional information on adrenalin will be found in Ewart's article, *PROGRESSIVE MEDICINE*, September, 1906.

Alcohol. Some interesting experimental work has been done on alcohol during the past year. The clinical use of the drug continues to be subject to as many differences of opinion as ever. In a study of the relationship between *alcoholism and heredity*, Rybakoff¹ found that in 94 per cent. of all alcoholics there was an hereditary tendency to drink or an hereditary predisposition to nervous or mental disease. He found that drunkenness in one parent usually leads to mild forms of drunkenness in the children, while drunkenness in both parents, as a rule, descends in a severe form upon the next generation. He believes that alcohol should always be prescribed with great care, and that when there is an hereditary predisposition, alcohol should be entirely avoided.

Friedenwald² has contributed an experimental study on the pathological effects of alcohol on rabbits. These very interesting experiments have been summarized by Professor W. H. Welch as follows:

1. Animals exhibit marked individual differences in their susceptibility to the injurious effects of the prolonged administration of intoxicating doses of alcohol. While certain individuals succumb quickly, others may be kept alive under these circumstances for at least four years without presenting any serious anatomical lesions attributable to the alcohol. Between the extremes, there are all gradations in susceptibility, young animals and pregnant ones being generally the most susceptible.

2. The experimental reproduction in animals of certain of the more characteristic diseases of human beings, attributable to the abuse of alcohol, such as cirrhosis of the liver, chronic Bright's disease, and arteriosclerosis, has not been satisfactorily attained. The most common pathological condition noted is a fatty metamorphosis affecting especially the cells of the liver, the heart muscle, and the kidneys. This lesion soon disappears after stopping the use of the alcohol. Death or necrosis of limited groups of cells in the liver and kidneys may occur, but is inconstant. More common is an acute or chronic catarrhal gastritis, but this, too, is often absent or but slight. Changes in the central nervous system, similar to those in acute alcoholism, as well as certain additional ones, may be present in experimental chronic alcoholism. Hyperemia and small hemorrhages may occur, especially in the stomach, the kidneys, and the brain. In view of considerable differences in the results reported by different experimenters, and of many still unsolved problems, additional experiments on the pathological effects of the long-continued use of alcohol and of alcoholic drinks are needed.

3. Alcoholic intoxication increases the susceptibility of animals to

Roussky Vratsch, April 1, 1906; *New York Med. Jour.*, May 26, 1906.
Jour. Amer. Med. Assoc., September 9, 1905.

many infections, and influences unfavorably the process of immunization. Pregnant rabbits repeatedly intoxicated by alcohol are likely to abort, and to die soon afterward from some accidental infection. Many of their young die a few days after birth.

The value of alcohol in *carbolic acid poisoning* has been made the subject of an experimental and clinical study by T. W. Clarke and E. D. Brown.¹ From their investigations they conclude that while alcohol has a local antidotal effect to carbolic acid burns, due to its solvent action, there is no evidence of a chemical antagonism between the two drugs. Once absorbed into the system, alcohol has no influence in carbolic acid poisoning, and placed together in the stomach the results do not differ from the results of carbolic acid alone. Lavage with alcohol is effective when the carbolic acid is in the stomach, but the results do not differ greatly over lavage with water. In fact, it is to the lavage that Clarke and Brown attribute most of the benefit, and a consideration of the statistics bears out their claim. They do not wish, however, to be understood as considering that alcohol is of no value in cases of carbolic acid poisoning, for both from their own clinical experience and in the literature it appears to be an aid in saving life when properly used. Owing to the solvent action of the alcohol they caution against allowing the alcohol, when used as an antidote, to remain in the stomach.

The procedure recommended by Clarke and Brown in poisoning cases is immediate abundant lavage, with 10 per cent. alcohol, to be followed at once by lavage with plain water. Stimulants are to be used as indicated. The special point to be borne in mind is that the alcohol is not effective after the carbolic acid has been absorbed, and to be effective must be used while the poison is still in the stomach. They mention one other point of value. In passing the stomach tube, with a comatose patient lying on his back, the stomach contents regurgitating around the tube may enter the larynx and set up inflammatory processes in the lung. To overcome this danger, immediately after the tube is passed, the patient should be turned on the side, with the head low, in order that any regurgitating material may escape from the mouth.

Another experimental study with alcohol has been made by Valentino.² He found that the brain takes up larger quantities of alcohol than the other tissues and the dehydration is more intense in the brain on this account. He believes that alcoholic coma is due to the dehydrating of the brain tissues. He demonstrated experimentally that animals under the influence of dehydration could tolerate large doses of strychnine and snake poison which would otherwise prove fatal, as the dehydrated brain does not take up these poisons as readily as the normal brain.

¹ Jour. Amer. Med. Assoc., March 17, 1906.

² Presse Médicale, September 9, 1905

Valentino's experiments may explain the traditional benefit large doses of alcohol have in snake poisoning.

Articles by Crother's,¹ Blackader,² and Hutchison³ are practically in agreement that the widespread use of alcohol as a medicinal agent is no longer in vogue. Blackader is of the opinion that while alcohol is not an efficient cardiac or respiratory stimulant, if administered in frequently repeated small doses its effect on the circulation is favorable. He favors its use in this way in conditions with a determination of blood to the interior of the body as indicated by cold extremities, livid skin, small pulse, scanty urine, and high rectal temperature, a condition which has been described as bleeding into the splanchnic area. In these cases alcohol, by dilating the superficial vessels and equalizing the circulation, may be of service. Under the same circumstances it may be of value in counteracting the constrictions of the peripheral vessels in the chill or rigor associated with the onset of disease. Hutchison, in writing on the use of alcohol in the fevers, calls attention to the discrepancy between clinical experience and laboratory findings in regard to the effect of alcohol as a simulant. While laboratory experience is entirely against alcohol having any effect on the heart, Hutchison is convinced that its effects are beneficial and that it must have fallen to the lot of everyone to see a rapid, feeble, and irregular pulse in a febrile patient become slower, steadier and more regular under its influence. He suggests that the beneficial affect of alcohol on the heart may be due to its action on the nervous system, and that by slightly narcotizing the nervous mechanism of the heart it may render the latter insusceptible to the influence of high temperature and the toxin of the fever, and so enable it to maintain the even tenor of its way unaffected by disturbing influences. Fever alone does not demand the use of alcohol, and its use should be reserved for those cases with failing circulation. An indirect effect of alcohol on the heart, such as Hutchison suggests, receives another explanation from the investigations of Kochmann.⁴ According to Kochmann, alcohol exerts a special influence on the abdominal plexuses which govern the abdominal circulation and that of the inferior extremities. This action, which probably has its principal seat in the splanchnic ganglia, produces an energetic vasoconstriction, the result of which is to increase the general pressure and cause a more active circulation in the coronary vessels of the heart.

While Hutchison recommends alcohol in the fevers, because of its action on the heart, Blackader uses it because of its value as a food.

¹ Amer. Med., November 18, 1905.

² Montreal Med. Jour., November, 1905.

³ Clinical Journal, November 22, 1905.

⁴ Quoted by Dauwe, Gazette des Hôpitaux Civils et Militaires, April 10, 1906.

He states that its value in these conditions consists in its quality as a food in itself and as favoring the digestion and absorption of other foods. He deprecates its use in large amounts as it may do harm by destroying the resisting powers of the organism. This was one of the conclusions reached by Friedenwald.

Blackader recommends alcohol highly as a *narcotic*. This is the only good effect which Crothers will admit for the drug. Allusion has been made to the fact that alcohol when used experimentally destroys the resisting power of an animal to germs. Hutchison, however, is seemingly in accord with most clinicians in the belief that in the septic fevers (erysipelas, septicemia, puerperal fever) alcohol has a most beneficial effect.

The use of alcohol as a wet dressing was alluded to last year. Pfuhl¹ also recommends the use of it for *open wounds* of the soft parts and for contusions. The antiseptic action of the alcohol is increased by the addition of water up to 40 or 50 per cent., but is reduced by further dilution. Pfuhl uses the alcohol in a 50 per cent. dilution for open wounds, and in the strength of 90 to 96 per cent. when the skin is unbroken.

There have been few references to *wood alcohol* during the past year. Gifford² has reported a case in which a very limited exposure to the fumes of methyl alcohol led to poisoning with amblyopia. Exposure to the fumes for three or four hours while painting a tightly closed room, 16 x 14 x 8 ft., was sufficient.

Hawes³ reports a similar case in which amblyopia with poisoning followed the application of shellac to furniture in a closed room. In this case the symptoms developed at the end of the second day.

Antidiphtheric Serum. A monograph on "Serum Disease" has been published by Pirquet and Schick, of Vienna.⁴ Symptoms of serum disease usually appear after an incubation period of from eight to twelve days. The general symptoms may be preceded by some redness and tenderness at the site of the injection together with swelling of the associated lymph nodes. Fever is an almost constant sign, usually of a remittent type, although toward the end it may become intermittent. The rash varies greatly in the same individual but the most common type is urticarial. When morbilliform in character a high fever is commonly present. The eruptions when generalized tend to be symmetrical, and their duration rarely exceeds three days. The swelling of the lymphatic glands may be confined to the associated nodes or may be generalized. Subsidence of the glandular swelling indicates the end of the disease. The involvement of the joints is not so constant; those most constantly involved are the metacarpophalangeal, the wrist, and the knee.

¹ Berl. klin. Woch., February 12, 1906.

² Ophthalmic Record, June, 1906.

³ Boston Med. and Surg. Jour., November 9, 1905.

⁴ Jour. Amer. Med. Assoc., April 7, 1906, editorial.

The salicylates have no influence on the joint symptoms. Edema is constant and occurs in the same situation as that of renal edema; it may be succeeded by a slight albuminuria. In patients who have received more than one injection of serum the symptoms may appear at once or in four or five days after the last injection.

The explanation of the symptoms following the injection of serum is not clear. Precipitins have been credited with these changes, but eruptions and other symptoms may occur after one injection, in individuals whose sera contain no precipitins and, on the other hand, may fail to develop in individuals whose sera contain precipitins in abundance. As was pointed out last year it is difficult to ascribe the eruptions to minute emboli due to precipitins, because of their evanescent nature.

Diphtheria antitoxin now enjoys the distinction of being the only serum which is officially recognized by the U. S. Pharmacopeia. Stewart¹ has contributed an article in which every detail regarding this serum is carefully explained. Its official name is *serum antidiphthericum*.

While there have been some who have claimed good results from the oral administration of antitoxin the universally accepted method is to inject it under the skin. The site chosen is between the scapulas. In children this is particularly advisable, as they cannot witness the operation, and hence are less likely to be frightened.

The official dose as a curative agent is given as 3000 units. The doses which have proved most successful in the various forms of diphtheria were given in last year's PROGRESSIVE MEDICINE, December, 1905, p. 290.

Stewart emphasizes the following points: (1) Large doses given at the earliest possible moment will almost certainly avert a fatal result. It is now pretty clearly demonstrated that the death-rate in diphtheria increases with the length of time elapsing between the initial symptoms and the injection of the serum. (2) Immunizing doses to exposed individuals affords protection for from three to four weeks. The official immunizing dose is 500 units, but this may preferably be doubled. (3) Age has no effect on the dosage. Children but a few days old may be given immunizing doses without danger. (4) There are no contraindications to the use of diphtheria antitoxin in the presence of diphtheria symptoms. (5) Enormous amounts of the antitoxin may be given without danger; 20,000, 30,000, or 40,000 units may be given.

Street² has recorded a case of diphtheria complicated by scarlet fever in which 67,000 units of antitoxin were administered.

According to the directions of the Pharmacopeia the strength of the serum becomes uncertain after a year and should be replaced by fresh serum. Layson³ has made a study of this question and concludes from

¹ Amer. Med., March 24, 1906.

² Med Record, November 18, 1905.

³ Amer. Med., October 28, 1905.

his tests that when kept under the most perfect conditions the majority of serums retain their potency undiminished for two to five years. Even under less favorable circumstances, with the extremely bad conditions commercial antitoxin is subjected to, the loss of antitoxic strength in one to five years varies from that which is inappreciable to one in 33.3 per cent.; even this extreme loss, however, would not impair the value as stated on the label as American serum has sufficient strength added to counteract this loss.

It is a common experience to find diphtheria bacilli in the throat for days and weeks after recovery. Injections of antitoxin under the skin and antiseptic gargles have little effect on these germs, and liquid serum cannot be applied sufficiently long to do any good. Dopfer¹ has employed pastilles of gum incorporated with dried serum. Twelve daily were ordered, one every hour, and allowed to melt slowly. He treated in this way 72 patients, 25 with true diphtheria and 47 with pseudomembranous angina. In the first group the bacilli disappeared in from two to five days in the second in from three to six days. This local treatment renders the results more prompt; relapses and paralysis of the velum palati may be averted and the period of isolation is certainly lessened. Billings² has published the results obtained in the ten years in which New York City has been furnishing diphtheria antitoxin. For the three years prior to the introduction of antitoxin the mortality was 37.3 per cent.; in 1902-1904 it was only 10.8 per cent. While laryngeal diphtheria was formerly quite common it is now greatly reduced. Billings attributes this to the early, larger, and frequently repeated doses of antitoxin.

According to the Commissioner of Health of Chicago the present death-rate in that city is due solely to the neglect to use antitoxin. He claims that if antitoxin were used as freely in private practice as by the medical inspectors the death-rate would be reduced one-half. In view of all that has been written on the subject one is at a loss to explain this neglect, more especially when it is known that the health department furnishes the remedy gratuitously. Practically every physician must be aware of what the commissioner asserts with the greatest emphasis, *i. e.*, that no child will die of diphtheria to whom 3000 units of a pure tested diphtheria antitoxin is administered in the early stage of the disease.³ The death-rate in Philadelphia has been considerably reduced since the Health Department has supplied antitoxin gratuitously to physicians desiring it. In order that antitoxin may be easily accessible to the country practitioners, Samuel G. Dixon, Commissioner of Health

¹ Annals of Gynecology and Peditary, September, 1905.

² N. Y. Med. Jour., December 23, 1905.

³ Medical Record, November 18, 1905, 823

for Pennsylvania, has provided for distribution stations throughout the state.

In the treatment of *heart failure in diphtheria* C. Bolton¹ emphasizes two points: (1) the prevention of cardiac failure and (2) rest, both mental and physical.

The first indication is met by administering antitoxin early and in large doses. Bolton recommends as an initial dose 4000 to 6000 units, and in severe cases would give as much as 12,000 to 24,000 units, repeating the last doses the following day if the symptoms had not improved. He has found no greater tendency to untoward effects from large than from smaller doses.

The second indication is met by the avoidance of any sudden exertion during the acute stage and during convalescence. In the absence of any apparent heart lesion getting up too early will often bring a latent cardiac weakness into evidence. White² also lays stress on a sufficient period of rest in bed. He furthermore recommends noting the effect of mild exercise on the heart for several months at least.

As has been noted in previous numbers of *PROGRESSIVE MEDICINE* diphtheria antitoxin has been used in a variety of conditions with alleged good results. In no case of this kind has there been an adequate explanation of how the serum does good. Hamilton³ has used it in a case of chorea; Rénon and Fixier⁴ in pernicious anemia, and Lopez⁵ in uncomplicated scarlet fever. He also has found the serum effective in other forms of angina, as tonsillitis, quinsy, etc.

Antistreptococcus Serum. Reports on this serum have been less numerous during the past year. Wolff's⁶ suggestion as to its prophylactic use is reported on by Fromme,⁷ who is favorable to this use of the serum. In eleven out of thirteen cases of *uterine cancer* the after-course was very satisfactory, as were the results of eight other cases for various gynecological affections. Fromme also advocates the use of the serum in incipient streptococcus infections; its administration for therapeutic effect in well-developed cases of streptococcic infection gave poorer results. As a prophylactic measure Fromme administered the serum in 10 c.c. doses three or four hours before operating.

In previous years there have been favorable reports on the use of anti-streptococcic serum in *scarlet fever*. Schick⁸ has used the serum in scarlet

¹ Lancet, February 3, 1906.

² Jour. Amer. Med. Assoc., October 21, 1905.

³ Medical Record, June 10, 1905.

⁴ Abst. Jour. Amer. Med. Assoc., July 14, 1906.

⁵ Amer. Med., February 3, 1906.

⁶ *PROGRESSIVE MEDICINE*, December, 1905, p. 296.

⁷ Münch. med. Woch., vol. lii, No. 52.

⁸ Deut. med. Woch., December 28, 1905.

fever with favorable results. In 60 of the severest and least hopeful out of 660 cases the mortality was 16.6 per cent. The serum employed was that of Moser in doses of 200 c.c. A serum reaction was noted in a number of the cases, but it was nearly always slight and in no way interfered with the convalescence. Ganghofner,¹ in a smaller series of cases did not obtain very good results. Of fifteen grave cases of scarlet fever treated by Aronson's serum, 7 died. This serum was administered in doses of 10 c.c. to 30 c.c. An additional series of 8 cases treated by Moser's serum showed 5 deaths. In spite of these poor results Ganghofner proposes giving the serum a more extended trial.

Raw,² during the past eight years has used a polyvalent antistreptococcic serum in more than 200 cases of *sepsis* and has come to the conclusion that in purely streptococcal infections the serum is of great value, especially if administered per rectum. When used per rectum the following procedure is followed: The bowels are freely moved and are afterward gently washed out with a little warm saline solution. Serum 20 c.c. and normal saline solution (100° F.) 40 c.c. are then gently injected into the rectum morning and evening or as required. This method produces no pain or discomfort; the serum is rapidly absorbed and apparently exerts the same influence as when injected under the skin. Skin rashes rarely occur and thirst and dry tongue are relieved. The small amount of fluid injected into the rectum causes no disturbance and is readily retained by the patient.

Introduction of the serum per rectum was also practised by Pottenger and Browning³ in twenty cases of *tuberculosis* suffering from mixed infection. From their study of the serum in this class of cases they conclude:

1. The results of various investigations show that streptococci are found in lung tissue beyond the areas of necrosis, and can be present without causing any acute symptoms, such as high fever, chills, etc.

2. The products of the tubercle bacillus are capable of producing symptoms very near, if not identical, with those of so-called mixed infection, and it is possible that these are sometimes due to the one cause, sometimes to the other, and perhaps at times to both working together.

3. That the streptococcus plays a part, at least in some cases of so-called mixed infection in tuberculosis, and that streptolytic serum has at least some specific action on the streptococcus, as witnessed in the reduction of fever and abatement of symptoms in some of these cases of hectic type, and, further, that the streptococcus plays some part in the general pathology of the tuberculous process of those chronic cases without marked symptoms (the earlier ones we have not yet investigated),

¹ Deut. med. Woch., 1905, p. 529 and 592.

² Lancet, April 21, 1906.

³ Jour. Amer. Med. Assoc., March 24, 1906.

as is shown by the altered character of the sputum, becoming thinner, less purulent and diminished in amount, and in the general improvement which follows the administration of the serum in nearly all cases.

4. The use of streptolytic serum in cases where no acute symptoms were present seemed to exert a favorable influence on the course of the disease sufficiently often to suggest that the presence of the streptococcus affects the tuberculous process unfavorably, even in many cases where it causes no active symptoms, and that mixed infection is a factor to be recognized and dealt with before the advent of threatening symptoms, the same as tuberculosis is to be diagnosed and treated before the advent of consumption.

5. This field is worthy of further study and investigation, and while we do not feel justified in drawing any absolute conclusions, we feel that our results so far warrant a continuation of our investigations.

Antitetanic Serum. In the last two years (1904 and 1905) I have devoted considerable space to the treatment and prevention of tetanus. At the present time our knowledge of the subject may briefly be considered as follows: Tetanus is met with in two forms, the acute and chronic. The acute form develops within a few days of the receipt of an injury, and once the symptoms have manifested themselves treatment of any kind is usually unavailing. The subacute, or chronic type, does not appear until sometime after an injury, and is frequently followed by recovery. It is in this latter type that most of the cures have occurred from the use of antitoxin.

After many years of failure as a curative agent it has now been established, beyond a reasonable doubt, that antitetanic serum will prevent the manifestations of tetanus if given immediately after the receipt of an injury. The type of wound most frequently followed by tetanus is that inflicted by toy-pistols, blank-cartridges, giant firecrackers, and punctured wounds, especially those produced by stepping on rusty nails. Such injuries carry the infecting organism deeply into the tissues and the external opening is prone to become sealed. These conditions are ideal for the growth of the tetanus bacillus as the serum and clotted blood offers an excellent culture medium; in addition the bacillus thrives without the presence of air. The annual Fourth of July epidemics of tetanus are abundant proof of the danger of this character of wound.

A review of these facts make it apparent that every effort should be made to protect the public against themselves by rendering it unlawful to use toy-pistols, giant firecrackers, or blank cartridges. If, however, such a wound is encountered no chances should be taken. The wound must be looked upon not as a possible but as a probable forerunner of tetanus, and treated in the following manner: The patient should be anesthetized and the wound widely opened and thoroughly cleaned by means of

of a curette, careful search being made for dirt and other foreign material. Free drainage is necessary. For prophylactic purposes 5 to 10 c.c. of serum should be injected subcutaneously, preferably in the vicinity of the wound.

This treatment constitutes a most efficient prophylaxis. "We have yet to hear of a single instance in which a patient with a blank cartridge wound who received a prophylactic injection of antitoxin later developed tetanus, although there were instances enough of such wounds not so treated that were followed by tetanus."¹ I have repeated the above quotation from last year because the same journal in a recent editorial says: "We can add nothing to what we have previously said concerning the prophylaxis of Fourth of July tetanus, the sum and substance of which is that every penetrating or lacerated wound received from Fourth of July explosions must be treated as if it were known to contain bacilli in its deepest recesses."²

The extremely unsatisfactory results obtained after tetanus has once developed make it imperative that every precaution should be taken to prevent the disease. For this reason not only Fourth of July wounds but all wounds of a penetrating character had best be subjected to thorough cleansing and free drainage, and, wherever possible, to prophylactic injections of antitoxin. The prevention is so certain and the mortality so high, when once the disease has developed, that neither trouble nor expense should form a reasonable excuse for failure to carry out the treatment.

The following table taken from an article by Scherck,³ of St. Louis, speaks for itself:

CASES TREATED IN CITY DISPENSARIES.

	No. cases.	Antitetanic serum.	Deaths from tetanus.
1903	56	No.	16
1904	37	Yes.	None.
1905	84	Yes.	None.
1906	170	Yes.	None.

The increased number of cases treated after the last Fourth of July is ascribed by Scherck to the benefit of newspaper aid. Through the daily press the public was warned of the grave danger of Fourth of July wounds, and were directed in case of injury to apply at once to one of the city dispensaries, where everything was in readiness.

Antithyroidin. The success which attended the treatment of myxedema with thyroid extract has led to numerous efforts to counteract the effects of overstimulation of the thyroid glands, which is generally believed to be the cause of *exophthalmic goitre* or *Graves' disease*. The

¹ Jour. Amer. Med. Assoc., July 17, 1903

² Ibid., June 23, 1906.

³ Ibid., August 18, 1906.

recent work of Rogers and Beebe¹ is extremely interesting and their results would seem to justify the hope that an efficient serum has been found.

Among the methods which have been tried to overcome the over-activity of the thyroid gland Rogers mentions the following: the serum of thyroidectomized dogs drawn after the animal had been operated on and had developed symptoms of athyroidism; the serum of a patient suffering from fully developed myxedema; the serum (thyroidectin) and the fresh and dried blood and the fresh and dried milk of thyroidectomized goats (rodagen), known as "Möbius' serum;" the serum of herbivorous animals which had been fed for varying lengths of time on the thyroid glands of animals of another species and the serum of animals into which emulsions of the thyroid glands of another species had been injected.

The preparation of a serum for use in exophthalmic goitre was suggested to Rogers and Beebe from the specific character of a nephrotoxin which the latter had made from dogs' kidneys.

Two large goitres recently obtained from cases suffering from Graves' disease furnished the necessary material. These were ground to a pulp, and after extraction with normal salt solution and treatment with acetic acid and ammonium sulphate yielded a precipitate containing the nucleoproteids and the globulins, including thyreoglobulin or supposed active secretion of the thyroid gland.

At different times this precipitate was injected into rabbits and, after four or five weeks, the animals were bled to death from the carotid artery. With the serum thus obtained Rogers treated 10 cases of exophthalmic goitre with extremely satisfactory results. Typical cases were cured and Rogers states that their experience can be repeated with a serum made and administered in the same way. The great trouble at present lies in the difficulty of obtaining material to inoculate the animals and the technical difficulties in carrying out the process. The least error or variation in the process may spoil the finished serum or render it extremely dangerous. W. Gilman Thompson,² in the discussion of Rogers and Beebe's paper spoke most highly of the results obtained. He had seen eight or nine of Rogers' cases, several of whom had been under his general personal care. One case referred to was not expected to live twenty-four hours. Within forty-eight hours, after two injections of the serum, she rapidly improved, and at the time Thompson spoke, was up and about, apparently almost completely recovered. Good results following the use of an antithyroid serum are also reported by Kuh³ and by Elsner and Wiseman.⁴

¹ Jour. Amer. Med. Assoc., February 17, 1906.

² Medical Record, February 24, 1906, 323.

³ Medicine, September, 1905.

⁴ N. Y. State Jour. Med., June, 1906.

Apocynum Cannabinum. Of late years this drug has been little used although it at one time enjoyed a great reputation for the relief of dropsy. Duprey¹ reports good results from its use in a case of *mitral disease* with enlarged liver and ascites. Tapping gave but temporary relief and digitalis and iron were without effect. He added to the digitalis and iron one minim doses of the tincture of apocynum cannabinum. This was gradually increased to 10 minims t.i.d. The patient improved greatly; the amount of urine passed was largely increased. Duprey found that doses larger than 10 minims three times daily were not well borne. Too large doses he noted were also apt to cause congestion of the kidneys and may lead to suppression of the urine.

He recommends apocynum very highly because of its diuretic effects.

Shattuck² also speaks well of apocynum in the treatment of cardiac dropsy.

Balsam of Peru. Schlöffer³ believes that balsam of Peru possesses certain properties which make it very valuable in the treatment of *wounds*, especially where the tissues are crushed or infected. In these cases he pours the balsam over the wound so that every crevice is filled.

There is a possibility that the use of large quantities of balsam of Peru is not without danger. Richartz⁴ reports a case in which acute nephritis followed three inunctions of 10 per cent. Peruvian balsam for scabies. He has found the following formula very useful for superficial wounds and leg ulcers:

Balsam of Peru	15.0 gm.	(℥iv)
Silver nitrate	0.3 gm.	(gr. ivss)
Simple ointment	45.0 gm.	(℥iss)

Richartz states that this ointment can be applied to small areas without any danger of serious effects. When the balsam is applied in large quantities he advises examination of the urine.

Belladonna is apt to develop evidences of an idiosyncrasy more than almost any other drug in the Pharmacopeia. Last year mention was made of a case of belladonna poisoning following the application of a belladonna plaster. Doland⁵ adds three more cases. In one of Doland's cases symptoms of poisoning appeared ten hours after the application of a small plaster.

Atkins⁶ also reports a case with marked intolerance to belladonna. The patient, a woman with cellulitis of the leg without abrasion, had a solution of glycerin containing extract of belladonna applied locally.

¹ Lancet, September 30, 1905.

² Boston Med. and Surg. Jour., May 17, 1906.

³ Archiv. f. klin. Chir., 1906, No. 3.

⁴ Münch. med. Woch., 1906, No. 19.

⁵ Amer. Jour. Med. Sci., April, 1906.

⁶ Lancet, March 3, 1906.

Within half an hour the most extreme degree of belladonna poisoning developed.

Belladonna poisoning is most alarming, but, so far as known, has never been fatal. The treatment consists in the hypodermic administration of morphine and stimulation.

General Girard,¹ late Assistant Surgeon-General, U. S. A., for some years past has been using *atropine* and *strychnine* in the prevention of *sea-sickness*. Girard states that in almost every instance sea-sickness can be prevented by the hypodermic injection of atropine gr. $\frac{1}{120}$ and strychnine gr. $\frac{1}{60}$. This is administered at the commencement of the voyage, or when the sea becomes rough, or at the advent of a storm when the motion of the water causes nausea. As a rule one dose is sufficient for a whole voyage, apparently overcoming the disturbance until the voyagers acquire their "sea-legs;" but in a long trip with severe weather occasional doses are required to keep up the effect. In individuals who are refractory to belladonna a second dose may be given in an hour. Girard quotes the letters of a number of army surgeons who report favorably on this method of preventing sea-sickness. Drenkhan² recommends atropine very highly in conditions where it is advisable to relax muscles and keep them relaxed. He considers *puerperal sepsis* as a wound infection of the uterus, and if the organ can be kept still the infection remains localized and soon heals. Atropine, he believes, does this perfectly. Even if other organs are already infected the atropine does good by checking the absorption of toxic substances. He recommends 12 drops of a 1 per cent. solution three times a day; this can be increased to 20 drops three times daily. Accommodation may become disturbed. The bladder should be catheterized as the patients may not notice the distended bladder.

For accomplishing the same purpose Krusen³ recommends *ergot*. His idea, however, is based on just the opposite principle from that of Drenkhan. Krusen maintains that the relaxed uterus in *puerperal sepsis* with its increased internal surface furnishes an excellent opportunity for the absorption of pathogenic material. The use of ergot and strychnine promote involution, and by causing uterine contractions render less liable the transmission of infection through sinuses and lymphatics.

Beta-eucaine. Untoward effects from the use of beta-eucaine are not common. Kraus⁴ reports an instance in which symptoms of poisoning followed the injection of 10 c.c. of a 2 per cent. solution into the urethra. The man became faint and partly unconscious with increasing dyspnea,

¹ Jour. Amer. Med. Assoc., June 23, 1906.

² Therapeutische Monatsheft, vol. xix, No. 1.

³ Therapeutic Gazette, January 15, 1906.

⁴ Deut. med. Woch., 1906, No. 1.

distress and chills. The breathing also became quite shallow. This condition lasted about an hour and a half; the patient slept badly the night following and was forgetful for a day or so. Transient headache and vomiting may follow an injection of beta-eucaine. Kraus mentions several other instances in the literature. He employed wine, camphor, inhalations of oxygen, and faradization to the phrenic nerves.

Bicarbonate of Soda. Sears¹ reported a case of *diabetic coma* successfully treated by the administration of large quantities of bicarbonate of soda. The patient was admitted to the hospital in coma. He was immediately given eight ounces of sterile salt solution, containing bicarbonate of soda almost to the point of saturation, under the skin of each breast. In addition he was given bicarbonate by the mouth in the proportion of a heaping teaspoonful to each tumbler of water. No record of this was kept, but as the patient was very thirsty larger quantities were taken. The stupor rapidly decreased, although he remained drowsy for several days. Recovery took place.

The value of bicarbonate of soda in conjunction with salicylate of soda in the treatment of rheumatism is considered under the heading "Salicylates."

Bromides. Large and continued doses of the bromides in the treatment of *epilepsy* are not as much used as formerly. While bromide of potassium is ordinarily a comparatively harmless drug its continued use is not infrequently followed by serious results.

In last year's review I mentioned Spratling's² experience at the Craig Colony for Epileptics. Spratling stated that while the abuse of the bromides was less than formerly many patients were still received with pronounced bromic dementia. Here some years ago in a collective investigation on the use of bromides found that aside from skin eruptions and gastrointestinal disturbances, that the bromides instead of producing a sedative action will, if continued too long or in too large doses, give rise to mania or other forms of mental excitement. Recently, M. Allen Starr³ has reported two cases in which mental symptoms strongly suggestive of paresis developed.

Caffeine. Mirano⁴ has made a study of the effect of caffeine, given hypodermically, on *blood pressure*. After using caffeine in a variety of conditions, he concludes that because it causes vasodilatation of the vessels the blood pressure is lowered, but as it excites stronger cardiac contractions the fall in pressure due to the vasodilatation is in part counteracted. In arteriosclerosis caffeine raises the pressure as vasodilatation

¹ Boston Med. and Surg. Jour., November 30, 1905.

² PROGRESSIVE MEDICINE, December, 1905, 313.

³ Monthly Cyclopedia of Practical Medicine, 1906.

⁴ Riforma Medica, September 23, 1905; Medical Record, November 25, 1905

is not possible. It regulates the heart's action and usually shows the pulse due to the forcible contractions produced.

The diuretic powers of caffeine are demonstrated in a case reported by Rolleston and Attlee.¹ Their patient, a man aged thirty-six years, was suffering from an extreme degree of *renal dropsy*. After trying a number of drugs without effect they used caffeine citrate in doses of $7\frac{1}{2}$ grains three times a day. Almost at once the urinary output increased. At the time the citrate was given the patient was passing two pints of urine daily; it gradually increased to seven and a half pints and then settled to four pints when there was only slight edema about the ankles. Rolleston and Attlee administered the caffeine in the dose mentioned for twenty-five days; it was then diminished and eight days later discontinued.

Seen several months later the man appeared in perfect health, the urine at this time having a specific gravity of 1017 and but a faint trace of albumin.

Castor Oil. The following methods are serviceable for rendering castor oil palatable. C. J. McGee² recommends that a tablespoonful of castor oil be placed in an ordinary glass, to this add the juice of a medium sized lemon and stir. To this add a little ordinary baking soda (size of a large bean), stir briskly, and drink while effervescent.

The following combination³ is also said to be almost tasteless:

R.—Olei ricini	f 3 iv
Pulv. acaciæ	3 j
Syr. aurantii	f 3 j
Aquæ cinnamomi	q. s. ad f 3 j

Sig.—Take at one dose.

Personally I have found that the disagreeable taste of castor oil can be entirely avoided by pouring the oil in half a glass of beer. The oil readily floats on top and the slightly bitter taste of the beer effectually disguises it.

In diarrhea brought on by undigested food irritating the intestinal canal the following formula is recommended.

R.—Olei ricini	f 3 iv
Spt. vini gallici	f 3 ij
Tr. opii	℥ x
Aquæ cinnamomi	q. s. ad f 3 j

Sig.—To be taken at one dose.

Much the same formula is in use at the Phipps Institute for cases of tuberculous enteritis.

Chloride of Calcium. Netter⁴ recommends the administration of calcium chloride to prevent the occurrence of *urticarial rashes* after the

¹ Lancet, November 11, 1905.

² Jour. Amer. Med. Assoc., June 2, 1906, 1725.

³ Ibid., May 19, 1906, 1560.

⁴ Le Bulletin Médicale, March 28, 1906.

administration of diphtheria antitoxin. Netter found that a dose of 15 grains on the day of the injection and for two days afterward constituted an efficient prophylaxis.

Last year *potassium acetate* was recommended by Roehr¹ for the same purpose.

W. E. Dixon,² in discussing the control of *inaccessible hemorrhage*, points out that most of the drugs recommended for this purpose are worthless and some of them even dangerous. In the treatment of *hemoptysis* and *cerebral hemorrhage*, morphine and calcium chloride are recommended, the latter to be given subcutaneously or by mouth, to increase the coagulability of the blood.

Chloride of Sodium. The dechloridation treatment of *nephritis* was considered at length last year. Hare,³ in an editorial article on this subject, reminds us that the old views that the existence of nephritis could be determined either by the presence of albuminuria or a diminished output of area no longer hold true. That there are strong grounds for assuming that the continued diminished elimination of chlorides is indicative of acute or chronic parenchymatous nephritis, he believes to be fairly well established. In addition to the diagnostic significance of this fact it is of therapeutic importance, for if the diseased kidney fails to eliminate the chlorides, then, if the views of Widal, Achard, Juval and others are correct, edema or dropsy will occur as the tissues will require a greater amount of water to maintain the salt in solution. It is on this principle that the dechloridation treatment has been based. A patient who eliminates less chlorides than normal owing to a diseased kidney will eventually, unless the ingestion of the chlorides be cut down or entirely suspended, develop what Hare terms a cumulative effect. This, if the present view be correct, will lead to the formation of dropsy.

The fact that nephritic patients rapidly gain weight, if large quantities of salt are taken because of the resulting edema, has already been observed. Boyd⁴ has had such an experience. He suggests that the value of a milk diet in nephritis is probably due to the small quantity of sodium chloride which it contains. Furthermore the diuresis which follows the use of milk aids in relieving the edema.

The *diet* recommended by Widal (quoted by Hare) for dechloridation consists in the administration of half a pound of meat, a pound of potato, three ounces of sugar, three ounces of unsalted butter, and two and a half quarts of fluid.

Pater⁵ has been using a salt-free diet in the treatment of *scarlet fever*.

¹ PROGRESSIVE MEDICINE, December, 1905, 293.

² Lancet, March 24, 1906.

³ Therapeutic Gazette, April 15, 1906.

⁴ Scottish Med. and Surg. Jour., February, 1906.

⁵ Wiener klin. Woch., 1906, No. 13.

He obtained better results in the group of patients fed with a liberal diet (bread, rice, potatoes, eggs, butter, sugar, and milk, all without a trace of salt) than in those kept on an absolute milk diet. The nutrition was better, gain in weight greater and convalescence more rapid in the patients on a liberal diet. He believes that this is additional evidence against the exclusive milk diet in many of the febrile diseases, particularly in typhoid.

On the other hand, Zeigler found that of 100 cases treated with an exclusive milk diet not one developed nephritis. Of 115 cases treated in various ways, half of them developed nephritis, and of this number five died. Hare¹ has drawn attention to these results to show that, while the exclusive use of milk in all forms of nephritis is not necessary, this is not the case in acute nephritis, particularly that due to the infectious diseases. Then, too, milk is taken much better by children than adults.

For several years Grüner² has been observing the effect of sodium chloride in kidney affections. His studies have convinced him that the diseased kidney does not eliminate sodium chloride readily and that even in healthy infants if the daily intake of sodium chloride be suddenly increased there is retention of both chlorides and water and an increase of weight due to the retention of the water. For these reasons he thinks that in renal and cardiac dropsies and where there is a tendency to their development the patient should be put on a diet as free as possible from sodium chloride.

Richardson³ has written a review of the therapeutics of sodium chloride. He points out that this salt is one of the physiological necessities and that it should never be reduced below that point, viz., an elimination by the urine of from 5 to 6 grams (75 to 90 grains). The elimination of the chlorides from the diet of *epileptics* for the purpose of reducing the quantity of bromides used is condemned by Richardson. He states that the physiological value of sodium chloride is too great to be neglected and its elimination from the diet will produce a pathological condition. For this reason it cannot be good therapy to treat one pathological condition by the creation of another.

Todd⁴ recommends *saline beverages in typhoid fever*, believing that they aid in the elimination of bacteria and toxins and in heat dissipation. He advises the following mixture: Sodium chloride, gr. x; potassium bicarbonate, gr. v; water eight ounces, to this is added a teaspoonful of lemon-juice, which produces a mild effervescence and renders the drink palatable. From two to three quarts of this mixture are given daily.

¹ Therapeutic Gazette, October 15, 1905.

² Wiener klin. Rundschau, 1906, No. 12.

³ American Medicine, July, 1906.

⁴ Medical Record, April 14, 1906.

Climate. For convenience the various methods of applying fresh air in the treatment of disease will be considered under this heading. It is evident from the extensive literature on the subject that the profession is becoming keenly alive to the importance of fresh air in the management of various conditions other than tuberculosis.

In advising the use of plenty of fresh air in the house, particularly in the sleeping-room, one encounters the greatest opposition from the laity, and it must be confessed from not a few physicians. The objection is based solely and entirely on that terrible bugbear, a draught. To get in a draught, in other words a current of air blowing into a room, is to inevitably catch cold. To subject a person ill with pneumonia or tuberculosis to such a danger is to the lay mind sheer madness. Fortunately, we are now in a position to state positively that a "cold" is not due to a draught but is an acute infection transmitted from one individual to another.

President Eliot,¹ of Harvard University, in a recent address before the American Philosophical Society, has brought to light an interesting observation of Benjamin Franklin's on colds or influenzas. Franklin maintained that influenzas usually classed as colds do not arise, as a rule, from either cold or dampness. He pointed out that savages and sailors, who are often wet, do not catch cold, and that the disease called a cold is not taken by swimming. He maintained that people who live in the forest, in open barns, or with open windows do not catch cold, and that the disease called a cold is generally caused by *impure air, lack of exercise, or overeating*. He came to the conclusion that influenzas and colds are contagious—a doctrine which a century and a half later was proved, through the advance of bacteriological science, to be sound. Franklin closed his observations with the following remarkable statement: "I have long been satisfied from observation, that besides the general colds now termed influenzas (which may be spread by contagion as well as by a particular quality of air), people often catch cold from one another when shut up together in close rooms and coaches, and when sitting near and conversing so as to breathe each other's transpirations, the disorder being in a certain state."

Bridge² has contributed an excellent article on what he very aptly terms the draught fetish. As he states the popular notion that colds are due to draughts is one that is everywhere prevalent and it requires considerable skill to persuade the public of the fallacy. What I would particularly emphasize in Bridge's remarks is that the fear of a draught compels numberless people to breathe bad air constantly, thereby lowering their vitality and making them an easy prey for micro-organisms. As a result

¹ Jour. Amer. Med. Assoc., August 4, 1906, 381.

² The Outdoor Life, November, 1905.

they get all sorts of diseases, that constant fresh air might enable them to escape. As a matter of fact such individuals are more susceptible to catching cold than the people who either ignore draughts altogether or clothe themselves so that they can bear them.

Prudden¹ emphasizes the dangers of a dust-laden air. He advises that floors be cleaned by moist mops and that furniture, ornaments, etc., be cleaned with a moist cloth rather than the common practice of dusting, which only serves to stir up the dust and have it again resettle. Prudden believes that the infectious diseases of the respiratory tract are steadily on the increase and that this is largely due to the fact that people are more and more huddled together in offices, dwellings, travelling conveyances, and places of public assemblage. As ill ventilation is almost the rule in modern life, the respiratory tract is constantly in a state of lowered resistance from air impurities. Prudden also emphasizes the importance of preventing promiscuous spitting, as this is a most fertile source of this type of infection.

Linsley R. Williams² strongly advocates the establishment of more fresh air homes for the poor. Such homes are necessary among the poor laboring classes because of sickness, hardship, overwork or the want of work, overcrowding and under-feeding. It is his belief that such homes will do more good in both a medical and economical way in a week's time than several months of treatment in a dispensary.

During the past two years I have given Northrup's views on the treatment of *pneumonia* in infants. It will be recalled that he strongly advocated the placing of the pneumonic infant in a room in which all of the windows were kept open irrespective of the time of year. He³ has again contributed an article on this method of treatment. The case cited was a severe one in which the entire left side was involved. The temperature of the room was such that the nurses were compelled to wear heavy wraps day and night. For those who hold draughts in terror it is interesting to note that the fresh air moved the hair on the boy's forehead, passing in at one window and out at the other. Recovery took place in this case. J. M. Anders⁴ is a recent advocate of a plentiful supply of fresh air in the room of a patient ill with pneumonia. It has been his experience that pneumonia patients are in no danger of contracting cold from perfilation of the sick-room with fresh air and that the mere breathing of fresh air or the flowing of cool air over the face while the patient is confined to bed is practically unattended with risk in this respect. Anders states that this adjunct to the treat-

¹ Medical Record, February 3, 1906.

² Ibid., June 9, 1906.

³ Boston Med. and Surg. Jour., 1906.

⁴ Medical Record, July 7, 1906.

ment of pneumonia is contraindicated in exceptional cases only, and practically requires no selection of suitable cases. He has noted that the patients who constantly breathe fresh cool or cold air are in better general condition, as manifested by increased strength, an improved appetite and digestion, refreshing sleep, lessened severity of the cough, diminished breathing rate, fever, and pulse-rate. In other words the toxemia seems less than in cases treated by the usual methods.

G. F. Pitts, in a letter to the *Medical Record*, March 10, 1906, states that he was led to the fresh air treatment of pneumonia patients by Northrup's article. He gives the details of a number of cases so treated, showing that even in zero weather the windows of the sick-room may be left open with the greatest benefit to the patient.

The relation of climate to *tuberculosis* is still in an unsettled state, although it is becoming apparent that the problem is becoming more and more one of dealing with the tuberculosis patient in his home or in special dispensaries within easy reach. It is just as true now as it ever was that climatic advantages must be reserved for the well-to-do. To advise an individual with limited means or no means at all that his only hope is "to go West" has ceased to be wise. That such advice is still given, however, is also true, as I have frequent occasion to note. As I have said before in dealing with this question the exact financial status of the patient is an important item of information. If he has not the means to maintain himself at a health resort it is foolish advising such a measure. Indeed, we may go farther and say that the means for a bare existence still falls short of the requirement, for a reasonable amount of comfort is essential. A patient is far better off in his city environment with some of the comforts of life than he could possibly be in the best climate imaginable, if he has to put up with discomfort and poor food. An editorial article in the *Medical News*, May 26, 1906, puts the situation very clearly when it states that "without in the least detracting from the value of sanatorium treatment, it must be admitted that its field is limited, for working people cannot, in the great majority of cases, undertake a course of treatment which necessitates giving up their work. Sanatorium treatment, while always ideal, is, as everyone knows, applicable only to the favored few."¹ Several excellent articles on the "home treatment" of tuberculosis have been published by Pratt,¹ Griffin,² and Bradford and Seymour.³ Pratt's plan is an excellent one and should have many imitators. His method has been to give a maximum amount of attention to a few rather than a minimum amount to many. His "tuberculous class," which is financed by one of the Boston churches

¹ Boston Med. and Surg. Jour., February 22, 1906.

² Ibid., March 15, 1906.

³ Medical Record, September 2, 1905.

is limited to fifteen. Strict discipline is maintained by a nurse who visits each patient and sees that instructions are carried out. This class has been limited to incipient cases only, and a fee of two dollars a month is required. Weekly meetings are held and in this way the details of how they should live are carefully gone over.

The secret of making the home treatment a success lies in a thorough supervision of the patient in his home. It is not enough to give the instructions and trust to the patient to carry them out. Supervision either by a physician or nurse is absolutely necessary to see that the rules are lived up to.

Abroad much attention has been paid to the establishment of seaside sanatoria for the treatment of *surgical tuberculosis* in children. In this country this aspect of the problem has received little attention until recently. One of the most noteworthy articles I know of bearing on this subject has been contributed by William S. Halstead,¹ of Baltimore. The article is one that does not lend itself readily to abbreviation, and should be read in the original by all who are interested. It is interesting to note that the out-door or fresh air treatment of surgical tuberculosis has been practised since 1890 by Halstead, and that he is the pioneer in this field as Trudeau is in the sanatorium treatment of pulmonary tuberculosis in this country. For the past sixteen years Halstead has been sending his private patients to the Adirondacks, where they are subjected to the same kind of life as the pulmonary cases. In almost every instance his results have been most satisfactory. For hospital cases advantage is taken of the bridges connecting the various pavilions in the Johns Hopkins Hospital, and here cases of surgical tuberculosis are kept out-of-doors. This same plan has been adopted also in dealing with other surgical cases, particularly those with septic infection. The confidence inspired by this communication must be great, as the results are based on observations extending over a period of sixteen years. Three of Halstead's four pioneer cases are to-day living and well; the fourth, the earliest to adopt this plan (1890), died twelve years after he was first seen, of nephritis. One of these cases I personally know and can testify to the remarkable results obtained in her case.

Another article advocating the use of fresh air in surgical tuberculosis has been contributed by H. Augustus Wilson.²

It has been his experience that such cases are benefited greatly by a residence at the sea-shore. Owing to the proximity of Philadelphia to Atlantic City, Wilson has had ample opportunity to compare the progress of cases sent to the sea-shore with that of cases residing in Philadelphia. Invariably those residing at the sea-shore have far outstripped the city-treated cases.

¹ Amer. Med., December 2, 1905.

² Penna. Med. Jour., January, 1906.

Largely because of the results obtained at the French sea-shore sanatoria it has been believed that the sea air exercised a particularly favorable influence on bone and glandular tuberculosis. That fresh air is the essential point, however, has been demonstrated by Halstead's experience, and I believe as the method is extended this will be found more and more to be the case. Still another instance is the experience of E. H. Bradford,¹ who reports on thirty cases which were apparently cured at the Wellesley (Mass.) Convalescent Home. He also expresses the opinion that the sea-shore is not essential but that good results can be obtained anywhere providing a maximum of fresh air is provided.

Additional information on the treatment of surgical tuberculosis will be found in the article contributed to this volume by Dr. Bloodgood.

Cocillana. G. W. Norris² tested the expectorant properties of this drug in 31 *tuberculous cases*. He administered the drug in the form of the fluidextract in 5 minim doses every three hours. As much as 25 minims may be given. Although well spoken of as an expectorant Norris did not obtain as satisfactory results with the cocillana as with the following mixture which is largely used at the Phipps Institute.

R.—Ammon. chloridi	℥iv
Spiritus glonoini	℥i
Spiritus ammoniæ aromatici	f℥j
Tr. nucis vomicæ	f℥iv
Elixir calisayæ	q. s. ad f℥vj

Sig.—One teaspoonful in water, three or four times daily.

This mixture is designed to sustain the heart and relieve pulmonary congestion by dilatation of the systemic arteries. It is very unpalatable but gives excellent results.

Counterirritation. Wainwright,³ in writing on counterirritation, states that it is used to lessen congestion and inflammation of the deeper organs, to relieve pain, and to promote absorption of the deep products of inflammation. He states that the most correct explanation of the action of counterirritation is through the reflex effect of sensitive cutaneous nerve areas on the deeper parts.

For the past year I have been using blisters in the treatment of pulmonary *tuberculosis*. They are very effective in pleuritic pains and will also aid in the absorption of effusions. It has also seemed to me that the blisters aid in drying up the moisture when the tuberculous lesion is localized at an apex. It is believed by some that the absorption of the serum produced by the blister has a favorable influence on the tuberculous process. When counterirritation is desired it is best obtained by means of the ordinary "fly blister" (emplastrum cantharidis).

¹ Boston Med. and Surg. Jour., January 8, 1906.

² Therapeutic Gazette, June 15, 1906. ³ Medical Record, September 30, 1905.

A hot compress should first be placed over the site to be blistered and allowed to remain until the skin has become hyperemic, the "fly blister" (preferably two inches by two inches) is then put on and allowed to remain from two to four hours; when fresh two to three hours is usually sufficient. Shortly after this a large bleb filled with serum will form. In tuberculous cases this bleb should not be broken but allowed to absorb. The blister should be protected by a sterile gauze pad and adhesive strips; if it breaks zinc oxide ointment is a soothing and efficient application.

Sepet¹ has used cantharidal blisters in the treatment of *pneumonia* with alleged good results. In his opinion they have an extremely beneficial effect and are free from objections.

Wainwright speaks of the actual cautery as an efficient counter-irritant. Trudeau has used the actual cautery for the relief of distressing cough and chest pains in cases of advanced tuberculosis.

Under this heading an article by Aurness² on the use of *cold in acute inflammations* may be considered. He states that this means of combating inflammatory conditions is not only safer but far more efficient than the use of antipyretic and analgesic drugs. The use of an *ice-bag* will not only relieve pain and congestion but what is of greater importance will tend to prevent the formation of pus as it has been shown by Winternitz, Esmarch and others that cold retards the growth of bacteria. Aurness believes that the use of an ice-bag for applying cold is far superior to cold currents of water, cold air, or the various freezing mixtures.

In order that the degree of cold used shall be constant the ice bag should be provided with a drainage tube so that the melted ice is constantly carried off. Such a bag Aurness has devised.

He recommends the ice-bag in inflammations involving any of the serous membranes, acute gastritis, acute pelvic diseases, acute cystitis, appendicitis, hemoptysis, hematuria, typhoid fever (head and abdomen), scarlet fever (head), erysipelas, headache, and neuralgia. Aurness says that cold is also very beneficial in pneumonia.

Diet. The large number of articles relating to diet is another evidence that there is an increasing amount of attention being paid to the treatment of disease other than by the use of drugs. Furthermore, we are learning that some of our ideas on diet may be very materially modified. Thus, there is an increasing number of physicians who are giving a more liberal diet in typhoid fever, a disease with which a milk diet has been so long associated that many are still loth to make a change.

Kinnicutt³ has recently made a study of the results obtained in *typhoid fever* after different methods of feeding. While there is considerable

¹ Bulletin générale de thérapeutique, March 30, 1906.

² Jour. Amer. Med. Assoc., March 24, 1906.

³ Medical Record, June 23, 1906.

difference in the number of cases fed on a liberal diet as compared with those fed on a fluid diet the following figures are interesting and should help to dispel the fear that the use of solid food in typhoid is attended with danger. In 733 cases of typhoid fever fed upon a liberal diet there were forty-eight relapses, or 6.55 per cent.; hemorrhage occurred in 35, or 4.77 per cent.; perforation in 10, or 1.36 per cent.; mortality 60, or 9.47 per cent. There were 4277 cases fed upon a fluid diet, with 500 relapses, or 11.69 per cent.; 382 cases had hemorrhage, or 8.93 per cent.; perforation occurred in 104 or 2.43 per cent.; mortality, 457, or 10.68 per cent. While it is possible that if an equal number of cases liberally fed were compared with the results obtained in those treated with a fluid diet the differences might be less striking, still I think the evidence is sufficient to warrant more liberal feeding. Hare in discussing Kinnicutt's paper repeated his views in favor of a liberal diet. Shattuck stated that he had employed a liberal diet for the past thirteen years.

In regard to the dietetic management of *nephritis* a more liberal view prevails than was formerly held. It is now believed that red meats, once so universally condemned as harmful, are no more deleterious than white meats, and that it is often a mistake to entirely deprive a patient of these strength-giving articles of diet. Milk is now looked upon as being unsuitable as the sole and only article of diet except in the acute forms of nephritis.

Shattuck¹ has the following to say in regard to the management of nephritis:

1. Such control as we may have to-day of nephritis lies in diet and mode of life rather than in drugs.

2. Such drugs as are useful are so in their effect on the general organism or on the heart rather than on the kidneys directly.

3. In all cases of nephritis our broad aim is to spare the kidneys unnecessary work, not forgetting that the urinary is but one of the systems which comprises the body.

4. In acute nephritis, as well as in acute exacerbations of the chronic forms, doctors, diet, and quiet should work together. Starvation for a few days, proportional to the intensity of the process and the strength of the patient, is the keynote of the dietetic management.

5. In the chronic forms we seek to lengthen and lighten life, an aim often largely within our power of attainment. Especially in the contracted form of kidney disease many years of life, much of the happiness which comes from achievement, days and nights of comfort, may hinge on our skill in adapting sound principles to the particular case and in securing the co-operation of the patient in carrying out the same persistently,

not spasmodically. Dietary restriction should be in the main quantitative rather than qualitative. Alcohol in moderation is not necessarily a poison and may be an aid to digestion.

6. The excess of proteid, not proteid in itself, is harmful to the chronically sick kidney.

7. A varied is more likely than a monotonous diet to promote the manufacture of good blood and thus to promote good nutrition of the body in general and of the myocardium in particular.

8. The amount of albumin is in itself no guide as to the extent of dietary restrictions.

Shattuck also believes it bad practice to force the amount of water, even in the absence of dropsy, as there is danger of destroying the compensatory hypertrophy of the left ventricle, upon which the maintenance of life more often depends than on the kidneys. The danger from the ingestion of large quantities of fluid is what renders milk unsuitable for prolonged use in the chronic forms of nephritis. This point is also emphasized by Morse,¹ who shows that in order to obtain the required number of calories a quantity of milk is demanded which may unduly tax kidneys already diseased. In order to reduce the amount of fluid, and at the same time keep up nutrition, butter, sugar, cereals, and bread should be added to the dietary. Meat extracts and broths are condemned because of their low food value and because they contain an excess of creatinin which must be eliminated by the kidneys.

Bradford² also advocates a liberal diet in the ordinary cases of chronic Bright's disease. In most acute cases small quantities of milk are all that is needed for the early stages, later an abundance of fluid may be indicated to flush the kidneys. If uremia or dropsy occurs in a chronic case, nitrogenous foods must be restricted and milk or gruel relied on until these conditions are relieved.

That disease of the *heart* and *bloodvessels* can be materially relieved by attention to the patient's food is not sufficiently recognized. Drugs, exercise, and baths are recognized as invaluable agents in dealing with disorders of the vascular system, but I do not think much thought is given to the diet.

Last year I quoted the views of Schott on this subject. Sir Dyce Duckworth³ calls attention to the fact that there are several forms of heart disease, notably mitral incompetence, in which compensation may be maintained for a long time. When the myocardial muscle begins to give way, however, both medical and dietetic measures are urgently required. So long as the hypertrophy is maintained the general nutrition

¹ International Clinics, 1905.

² The Practitioner, April, 1906.

³ Ibid.

should be kept up with plainly cooked food. Overloading the stomach either with solids or liquids is to be avoided; this is a point especially emphasized by Schott. If compensation fails, and is accompanied with dyspnea, palpitation, and edema, the meals should be small and the fluid limited in quantity and preferably given between the meals. So long as the food is easily digested there is no restriction. In the later stage of heart disease with an enlarged liver, dropsy, and engorgement of the portal vessels predigested foods, milk, barley-water, kumyss, and champagne are suggested.

In *arteriosclerosis* with high tension animal food should be reduced and the diet made up largely of vegetables, carbohydrates, and fish. Aneurysm usually demands that the intake of both solid and fluid food should be reduced.

Haig¹ expresses the belief that an insufficient amount of food has a direct bearing on heart failure. While an individual may go for a considerable length of time without food the tissues suffer to some extent. If continued long enough, or if a poor quality of food is constantly taken, the heart muscle will also inevitably feel the effect through poor nutrition. It is possible that this suggestion of Haig's would form an additional reason for a more liberal and nutritious diet in typhoid fever, where the amount of milk usually given (eight ounces every three hours) is all the food allowed for four or five weeks.

Under modern methods of treatment diet occupies the first place in the management of *tuberculosis*. There is almost general agreement that milk and eggs will give better results than any other form of food, particularly in those cases where the loss of weight is considerable. The greater the loss of weight the more need is there to use milk. In incipient cases where the loss of weight is slight (4 or 5 pounds below normal), or where there is no loss at all, I believe the method of feeding in use at the Adirondack Cottage Sanitarium is the most generally useful. At this Institution three full meals of simple, wholesome food are given, reinforced in a few instances, when weight is not taken on readily, by three or four glasses of milk. At the White Haven Sanatorium and at the Phipps Institute but one full meal in the middle of the day is allowed; this may be varied as much as desired, the only articles of food barred being veal and fresh pork. The rest of the dietary is made up of three quarts of milk and six eggs, which are evenly distributed throughout the day. Taking it all in all I believe this method of feeding the tuberculous patient is the most suitable one yet devised, particularly in an institution where a plan must be used which is adapted to all cases. It will produce greater gains in weight and less gastrointestinal disturbance than any other plan I know.

¹ Medical Record, May 20, 1906.

King¹ has contributed an article on the diet in tuberculosis in which he considers especially the question of overdoing forced feeding. He cites an instance which came under his observation in which a young man of twenty years had been taking three full meals and in addition nearly three quarts of milk and twenty eggs in twenty-four hours. Asked as to what directions he had received about taking this enormous quantity of food the patient stated that he had been told to eat all the meat he could and in addition to take as much milk and raw eggs as he could stand. Naturally his digestion was badly upset, so much so, indeed, that it was never restored to normal, and he eventually died. As King says, this is not an unusual instance but one that he not infrequently meets with. In this I agree most heartily. I venture to say that fully one-fourth of the patients admitted to my service in the White Haven Sanatorium come there with varying degrees of gastrointestinal disturbances which in most instances have resulted from the use of milk and eggs injudiciously given. A few simple precautions will almost invariably avoid trouble of this sort. In the first place if the patient is taking three meals a day, not more than three glasses of milk and two or three eggs should be given; the milk and eggs should then be taken at 10 A.M., 3 P.M., and at bed-time. When a full milk and egg diet is in use and but one meal at midday is allowed, the distribution of the three quarts of milk and six eggs should be as follows: 7 A.M., three glasses of milk, two eggs; 9 A.M., three glasses of milk, one egg; 4 P.M., three glasses of milk, one egg; 6 P.M., three glasses of milk, two eggs.

Furthermore, a certain amount of discretion should be used. Some patients can take with benefit two or three glasses of milk and a few eggs more than this amount, while others must have the amount reduced in order to obtain the best results. At the first evidence of digestive disturbance, such as anorexia, a furred tongue, nausea, vomiting, or diarrhea, the eggs should be stopped entirely and the milk reduced, say, from twelve glasses to eight. In addition a saline purge should be given and then for the next two to four days administer Epsom salts, grains ten, in solution, every three hours. I have scarcely ever failed to see this plan correct the gastric disturbance. Later some of the digestive aids may be used with benefit, such as hydrochloric acid, pepsin, or pancreatin.

Milk as a rule is always well borne. Patients are occasionally met with who say they cannot take milk at all, but with patience and the use of small quantities in the beginning they can usually be taught to take it without difficulty. Peptonized milk is serviceable at times and should be tried in obstinate cases of gastric disturbances.

The point I especially wish to emphasize is that food should be as

¹ Medical Record, July 21, 1906.

carefully administered to the tuberculous patient as are his medicine or the directions regarding the amount and character of exercise to be taken. General directions in regard to the diet are never permissible with these cases. The amount of food to be taken and the time should be stated explicitly and due regard must be paid to the capabilities of each individual.

Digitalis. While this drug is not a specific it is so generally employed in the treatment of cardiac disease and in meeting emergencies related to the circulatory system that few would be willing to give it up. Aside from the few specific remedies there is no drug which gives such satisfactory results. Its widespread use should, one would think, lead to some unanimity as to the method of its employment and the cases best adapted to its use. The majority of physicians are agreed, I believe, that digitalis is contraindicated in established compensation, in myocardial degeneration, in high arterial tension, and in most cases of aortic regurgitation. Furthermore, that its continuous use in full doses is inadvisable because of the danger of a cumulative action.

No less an authority than T. Mitchell Bruce,¹ however, disbelieves in the cumulative action of digitalis, and advises that with a small irregular pulse to push the drug instead of diminishing it. Hare,² in an editorial article, takes exception to this position, and also to Bruce's assertion to administer digitalis to a patient with a failing heart and in aortic incompetence. For such cases Hare recommends rest in bed and the use of strophanthus or sparteine. If these measures fail digitalis may then be employed, with the addition of nitroglycerin if arterial pressure be unduly high.

Bruce emphasizes the necessity of stopping digitalis once the compensation has been established. It is also suggested by Hare that if large doses of digitalis are used in aortic regurgitation, the patient be kept quietly in bed and not allowed to sit up or stand up, particularly for the purpose of emptying the bladder. It has been shown that cases under the influence of digitalis are very prone to syncope if the bladder is emptied while in the erect posture; this is particularly true if the lesion is that of aortic regurgitation.

In another editorial on digitalis and its derivatives, Hare³ calls attention to the difficulty of obtaining a preparation of digitalis that will always have a standard strength. Of the digitalis derivatives, *digitalone* is, in Hare's opinion, well worth a trial. Digitalone is physiologically active in doses varying from 5 to 30 drops, and can be administered hypodermically without producing any of the unpleasant local effects

¹ British Med. Jour., January 6, 1906.

² Therapeutic Gazette, March 15, 1906.

³ Ibid., December 15, 1905.

which sometimes follow the hypodermic use of the tincture of digitalis. Digitalone has the additional advantage of being tested pharmacologically to determine its physiological activity.

Another of the digitalis derivatives that has lately come into use is Cloetta's soluble *digitoxin* (*digalen*). Kohn¹ states that digalen is useful in mitral disease with failure of compensation or with renal complications; degenerations of the heart muscle, if not too advanced; and in aortic disease complicated by mitral failure.

The dose of digalen by mouth is 3 mg. ($\frac{1}{20}$ gr.) one to three times a day; the same amount may be given subcutaneously once or twice daily. Owing to its bitter taste digalen had best be given in a suitable menstruum, such as sweet wine. If a very rapid action is desired, as in cases of cardiac failure, the drug may be given intravenously. The intravenous dose is 1 to 1.5 mg. (gr. $\frac{1}{65}$ to gr. $\frac{1}{45}$) repeated in twelve to twenty-four hours if necessary, or diminished as the case demands.

Ergot. In last year's review the opinions of several writers were quoted to the effect that the routine administration of ergot after labor was bad practice and was gradually passing out of use. That there is not general agreement on this subject is evident from the replies received by the editor of the *Therapeutic Gazette*, January 15, 1906. The following questions were sent to five obstetricians (Davis, Hirst, Cameron, Coles, and Krusen): (1) Do you use ergot as a routine practice in all cases of labor? (2) If not in all cases, in what particular case? (3) Does any condition after the head is born contraindicate the use of ergot in your opinion? If so, what is it? (4) Is it your experience that the use of ergot, at the proper stage, is ever followed by any untoward effects or accidents? If so what are they?

With one exception (Krusen) these observers believe in and practice the routine administration of ergot. Davis makes but one exception, namely, excessive hemorrhage with a depleted condition of the vessels and a feeble heart. In these cases he employs saline transfusion with strychnine and if necessary digitalis. Packing of the uterus may be needed; later during convalescence small doses of ergot are given. In these cases Davis states that the uterus remains contracted from the stimulating effect of the strychnine and the uterine packing. The ergot is not used at once because it seems to increase the labor of the heart profoundly depressed by the loss of blood.

All state that the ergot should be withheld until the completion of the third stage of labor except Hirst, who gives it as soon as the child is born.

They are unanimous in the opinion that they have never seen any ill effects follow the use of ergot when administered at the proper stage.

¹ American Medicine, July, 1906

Hirst's opinion doubtless influences many in using ergot routinely. He says: "My reason for doing so is that having had in the early part of my experience some serious cases of postpartum hemorrhage from relaxation of the uterus, I feel that every precaution possible to prevent this accident ought to be taken in every case. I have never seen any disadvantage from the use of ergot."

Osborne¹ has contributed an article on the therapeutic value of ergot. He assigns to it eight distinct indications. Hare, however, in an editorial comment² on the effect of ergot on the circulatory system closes by saying "that its real value in therapeutics is largely, if not entirely, limited to its very powerful influence over the uterine muscle and the spinal centres which control it."

Eserin. This drug has been recommended for the *flatulency* commonly following abdominal operations. B. F. Stevens³ has recorded a case in which the drug was administered for this purpose, but through a mistake in orders received 2 grains of eserine sulphate instead of $\frac{1}{50}$ of a grain as intended. Within two or three minutes after receiving the hypodermic of eserine the patient turned a purplish color and the bowels moved profusely and involuntarily. The respirations became shallow, and the pulse almost imperceptible and the respiratory tract filled with mucus. She was unconscious for nearly twelve hours. The treatment consisted in hypodermics of atropine, nitroglycerin, strychnine, and brandy. Saline infusion was also injected beneath the breasts. Stevens attributed the patient's recovery to the dose of morphine and atropine given about an hour before the eserine was administered. He quotes Potter to the effect that large doses of eserine are counteracted by even small doses of *atropine*, which is the physiological antidote.

Eucalyptus Oil. Phillips⁴ has employed this oil in *ankylostomiasis*. His method is as follows: At 6 P.M. the patient takes a saline and then fasts all night. The next morning at 7 o'clock one-half the following mixture is taken:

Eucalyptus oil	℥xxxiv
Chloroform	℥lii
Castor oil	℥x

In an hour's time the remaining half is taken; the patient is then kept in bed fasting until the bowels move. If depression occurs after the first dose the second is omitted; this, however, rarely happens. In young boys and in feeble anemic patients the dose is divided into thirds and given at twenty minute intervals. Three to four liquid stools usually

¹ N. Y. Med. Jour., July 14, 1906.

² Therapeutic Gazette, February 15, 1906.

³ Jour. Amer. Med. Assoc., November 25, 1905.

⁴ Lancet, February 3, 1906

follow. Phillips now uses this method routinely in treating ankylos-tomiasis.

Benham¹ reports two cases of acute *poisoning from oil of eucalyptus*. In both cases the oil was swallowed by mistake. Its ingestion was followed by unconsciousness. An emetic was given which acted promptly, and a recovery ensued in both cases. Orr² records a similar case in a child in which recovery followed. Benham states that he knows of no fatal case following the taking of eucalyptus oil.

Exercise and Rest. In the December issue of PROGRESSIVE MEDICINE, 1904, I considered this subject, but in spite of all that has been written in its relation to *tuberculosis* there is still a most lamentable lack of knowledge in regard to its limitations. Several excellent articles have appeared during the past year, a review of which will give a very clear idea as to what should be done with tuberculous patients in the way of exercise. As Hilleary³ very aptly says: "In the vast majority of cases the general practitioner is the man who is called on to diagnose and treat these patients, and so has been lectured, criticised, and cajoled into making an early diagnosis only to meet with failure in the treatment. I do not think it amiss to point out the error that is responsible for failure in nine cases out of ten in otherwise curable cases, viz., exercise." This has also been my experience both at the White Haven Sanatorium and in private practice. There are few physicians at the present time who do not appreciate that forced feeding and plenty of fresh air are essential, but as Hilleary says not one in ten has an adequate idea as to the principles of rest and exercise. The frequency with which patients are advised to take exercise when they should be at rest either in a reclining chair or in bed is truly appalling. It is the failure to heed this aspect of the treatment of tuberculosis and the consequent failures that have led many to advise a change of climate, and when this is impossible to do nothing and leave the unhappy victim to his fate. For those who advocate a change of climate and a life in the open without taking into account proper medical supervision the experiences of Pogue, of Colorado,⁴ will prove interesting. He also advises individualization in treatment, particularly in regard to exercise.

The following quotations from Pogue's excellent article will bear repetition. "Patients are sent away from home for change of climate, and about the only instructions they receive are to get out and rough it. When they get to their journey's end, every person they meet gives them similar advice, at the same time pointing out individuals who have re-

¹ Lancet, December 30, 1905.

² British Med. Jour., May 12, 1906.

³ Jour. Amer. Med. Assoc., January 20, 1906.

⁴ Medical Record, December 9, 1905

covered their health by walking, riding horseback and climbing mountains, but they never tell the poor seeker after health of the hundreds who have gone over the great divide and have practically been forgotten, who tried the same remedies."

"The few who survive this vigorous exercise are but a small percentage of the number who employ it."

Farther on Pogue has this to say about "roughing it" in the West: "I have the histories of 62 patients with tuberculosis in various stages of the disease, seen during the last five years, who took the so-called 'roughing it' cure or active exercise; of these, 23 are dead, and only two show signs of having their disease arrested with a prospect of ultimate cure."

*"The healthy man sits down because he is tired; the tuberculous man should sit down so as not to become tired."*¹ As I have pointed out before, instead of adhering to the principle contained in Brehmer's motto the tuberculous patient is usually advised to take exercise, on the principle that as exercise is good for a healthy man it should be twice as good for one who is sick. Every tuberculous patient whether in the incipient or advanced stage should be put at rest for least two weeks at the beginning of the treatment. During this time the following points as stated by Stanton² should be noted: (1) Temperature, (2) pulse-rate, (3) respiratory rate, (4) degree of emaciation, (5) existence of complications in heart, kidneys, intestines, pleura, bladder, etc. To these I would add hemorrhage or blood-streaked sputum.

A temperature of the continuous type, 100° F. or above, indicates acuteness and progression of the lesion and calls for absolute rest in bed. The occurrence of an intercurrent cold or other condition which gives rise to a temperature of 100° F. or above also calls for rest in bed. In cases with a normal or subnormal temperature in the morning and an afternoon rise to 101° Stanton advises rest in bed. I would rather make the requirement for rest in bed 100°, and would also advise rest in a reclining chair for a patient having an intermittent temperature with an afternoon rise to 99.5°. After the temperature has quieted down below the figures given, exercise may be started, providing there are no other contraindications.

The tuberculous patient as a rule shows some acceleration of the pulse-rate. A pulse-rate of 120 or over in the morning calls for rest in bed; if it is 110 or under the patient may be allowed up a part of the day. A pulse-rate of 100 or under will permit the starting of exercise.

In the majority of cases the respiratory rate does not demand much consideration. When the respirations exceed 30 per minute exercise

¹ Brehmer's motto, quoted by Pogue.

² Proc. Phila. County Med. Soc., September 30, 1905.

should not be attempted. If exercise causes undue acceleration of the respiratory rate the exercise had best be reduced or temporarily abandoned.

In the absence of all other contraindications to exercise, great reduction in weight demands absolute rest until the weight has approached to within four or five pounds of the normal.

The presence of complications in tuberculosis must of necessity have an influence on the amount of exercise taken. If they dominate the situation, rest is, of course, essential. In any event the existence of complications, whether active or not, will render the amount of exercise taken far less than in an uncomplicated case. Hemorrhage calls for absolute rest in bed; the presence of blood-streaked sputum calls for rest in a reclining chair until the sputum is free from blood.

One other precaution may be added, namely, cessation or reduction of the exercise, if vomiting is brought on after its use.

The best form of exercise for the tuberculous patient is still a debated point. The objection to some forms is that trained supervision is necessary. Walking, because it requires no supervision and is easily regulated, is the form most generally adopted. A case with none of the contraindications mentioned above may be started on five, ten or twenty minutes daily with a three or five minute increase each day. The patient should be instructed to walk slowly and to choose for the daily walk a level stretch of road. Climbing gentle elevations may be included in the daily routine after the patient has demonstrated that several hours' exercise on the level causes no disturbance of the pulse or temperature. The occurrence of any of the contraindications calls for a suspension of the exercise at once.

It must always be borne in mind that of the two extremes excessive exercise and absolute lack of exercise the latter is the safer.

I agree with Hilleary that "I have never known rest, no difference how prolonged, to do any harm, while exercise brings more tuberculous patients to grief than all other things combined."

The use of exercise in *cardiac conditions* continues to receive attention. Hasebroek¹ has been treating *angina pectoris* with Swedish gymnastics. He remarks that while the mechanical treatment of diseases of the heart and bloodvessels is still in an empiric state, he himself has had most gratifying results in a number of cases of *angina pectoris*. The cases which he believes amenable to this form of treatment are those in which the trouble is probably a sensory reflex neurosis. This he determines by the presence of a pronounced sensitiveness to pressure on palpating the left thorax, most intense in the region of the apex-beat and extending to the axilla, or else the finding of tender points on

¹ Deut. Archiv. f. klin. Med., lxxxv, No 4-5.

some of the emerging points of the intercostal nerves to the left, close to the sternum, between the second and fourth ribs. In the obese, especially in women, there may be marked sensitiveness in the left mamma. The Swedish movements by exercising the large muscles affect the peripheral vasomotor system and draw the blood to the periphery.

Wainwright¹ has contributed an article showing the value of exercise in various conditions.

Glycocholate of Sodium. H. Richardson² recommends this drug in all diseases in which toxemia is a factor, and, with few exceptions, in cases with hepatic insufficiency. Richardson has found it valuable in cases of malnutrition from want of proper absorption of fats; in hepatic colic and gallstones and in chronic constipation. Because it increases the absorption of fats it is valuable in the treatment of *diabetes* and *tuberculosis*. It is also beneficial in *arteriosclerosis*. The glycocholate is usually given in the dose of 5 grains three times daily; as much as 15 grains may be given without producing nausea.

Guaiacol. Jacobi³ has been using guaiacol in the treatment of *pulmonary tuberculosis* for the past fifteen years. Under its use expectoration becomes more mucous, cough looser, and weight increases. All this happens in the average case among the poor who have none of the hygienic or dietetic advantages of the rich.

He recommends the following formulæ as being most efficient and in addition very cheap.

R.—Guaiacol.	50 parts.
Tr. nuc. vomice	40 "
Tr. strophanthi	30 "
Liq. potassii arsenitis	10 "

Sig.—A half a teaspoonful three times a day in hot milk.

R.—Guaiacol. carbonatis	30.0 to 40.0	(f 3j to j℥)
Strychninæ nitratis,		
Arseni trioxidi (acidi arsenosi)	āā 0.1	(āā gr. iss)
Sparteinae sulphatis	3.0	(gr. xlv)

M. et div. in chartulæ No. 1.

Sig.—One powder t. i. d. after meals.

This last formula can be taken for one to two months or even half a year. For those who can afford it Jacobi recommends *guaiacol carbonate* 30 to 45 grains a day.

Guaiacol is highly recommended by Schuller⁴ in the treatment of *tuberculosis of the kidney*.

Hydrotherapy. It will be recalled that in last year's PROGRESSIVE MEDICINE, December, 1905, p. 309, Anders' description of the Schott

¹ Med. Record, May 5, 1906.

² N. Y. Med. Jour., September 30, 1906.

³ Amer. Med., December 23, 1905.

⁴ Mittheilungen a. d. Grenzgebieten, vol. xv, No. 12.

method of treating *heart disease* at Bad Nauheim was given. Kinnicutt¹ has contributed a similar article, based as was Anders' on personal observations at Bad Nauheim. The composition of the baths, the technique of their use, and the character of patients amenable to the treatment were given by Anders.

Wackenfeld,² of Bad Nauheim, in a recent visit to this country, takes exception to the importance Anders has given to gymnastic exercises. According to Wackenfeld, Schott is the only man at Bad Nauheim employing exercise in the treatment of heart disease. In his opinion exercise in whatever form, cannot be too strongly condemned in heart disease. The value of the baths he attributes to their influence on metabolism. In all chronic diseases there are disturbances of metabolism to which the lymphatic circulation bears a very important relation. Even plain water baths bring about a stimulating influence in moving the body fluids. This action is more marked when the baths contain an increased amount of salts in addition to carbonic acid gas and other agents of physico-chemical nature as do the waters at Bad Nauheim.

Hirschfeld³ has obtained good results in the treatment of *arterio-sclerosis* by means of hot baths. The treatment should not be undertaken unless the left heart be sound and the vascular pressure good. He states that, in general, the baths are likely to do good in cases in which digitalis is contraindicated and conversely. If the patient be a male fifty-five to sixty years of age the bath may be begun at a temperature of 102° F., and the immersion should be not less than ten minutes. The degree of reactivity should first be determined. Hirschfeld attributes the good results of the bath to (1) reduction in blood pressure by unloading the internal organs and increasing the supply of blood to the skin; (2) increased combustion, as indicated by elevation of bodily temperature; (3) to increased elimination of waste products superinduced by the resulting perspiration.

Strasser and Blumenkrang⁴ have obtained good results in the treatment of *nephritis* by means of hot baths. They claim that diuresis and the elimination of nitrogen and sodium chloride are favorably influenced by immersing the patient in a hot bath (94° F.) for an hour to an hour and a half. The baths had no perceptible influence on the albuminuria.

Crofton⁵ also advocates hot baths for the various manifestations of *nephritis* (nervous, metabolic, gastrointestinal, and cardiovesicular). The treatment by means of baths must also be associated with proper regulation of the diet.

¹ Medical Record, May 19, 1906. ² Jour. Amer. Med. Assoc., March 10, 1906.

³ Australasian Med. Gaz., vol. xxiv, No. 7; Med. News, December 16, 1905.

⁴ Berl. klin. Woch., No. 14, 1906 ⁵ Medical Fortnightly, March 10, 1906.

Last year Heubner's method of treating *capillary bronchitis* and *bronchopneumonia* in children by means of hot mustard baths was described. Finzil¹ has also employed hot baths in these conditions. Finzil uses the hot baths at a temperature of 98.6 to 102.2° F. (a few degrees less than the temperature of the child treated). If the child is depressed he gives stimulants and follows Heubner's plan of adding mustard to the bath. After the bath the child is wrapped in flannel and allowed to rest in this way for half an hour. He attributes the good results to the following facts: (1) The increased inspiration during the bath and the inhalation of the hot vapor favor the elimination of the mucous which lines the bronchi; expectoration is also favored by lessening the thickness of the mucus. (2) The surface of the skin after an initial contraction of the capillaries is followed by a dilatation of these vessels. The skin becomes red and covered with sweat and this surface hyperemia relieves the bronchial congestion. (3) The sweating favors the elimination of toxins produced by the disease. Finzil has treated thirty-two cases in this way during the past year.

For some years Richter² has employed hot water in the treatment of *infected wounds*, *contusions*, *furuncles*, etc. His method is to immerse the injured part, several times a day, in water as hot as can be borne for at least half an hour. Half a tablespoonful of soda is added to each liter (quart) of water. When the injured part is not amenable to immersion he applies hot compresses and maintains the heat by means of hot water bottles.

Richter attributes the good results obtained by this method to the local congestion which is produced through the abundant supply of blood and lymph brought to the affected part. When necessary pus is evacuated through an incision.

Hinsdale³ has contributed an article on the value of hydrotherapy in the treatment of *epilepsy*. He states that the position of hydrotherapy in the treatment of epilepsy may be considered as a means of cure; an auxiliary method of treatment; a method making it possible to administer considerably larger doses of bromide than usual; a method rendering it possible to reduce the dose of bromide to a minimum; and finally as an excellent hygienic measure favoring the action of the skin and improving the general tone.

It is quite probable that the good derived from baths is due to the last-named factor. Those having the largest experience in the treatment of epileptics are laying more and more stress on the fact that the best results are obtained through hygienic measures rather than through any specific method of treatment.

¹ Abst. Med. Record, June 30, 1906, 1062. ² Münch. med. Woch., April 10, 1906.

³ Jour. Amer. Med. Assoc., January 2, 1906.

Iodide of Potassium. In the management of arteriosclerosis, Hare¹ states that in cases of arterial fibrosis with high tension the nitrites can be of but little value and the iodides with rest and massage are needful. He calls attention to a point which is entirely new, *i. e.*, the existence of vascular compensatory hypertrophy, which is quite as capable of giving way as is cardiac compensatory hypertrophy. In his opinion the rupture of the vascular hypertrophy is often nature's method of saving life, for by doing so the overtaxed heart is given a rest and is permitted to recover from its fatigue. The use of alteratives and vascular sedatives are indicated in these cases rather than cardiac stimulants.

Romberg² also states that the management of arteriosclerosis is based on the administration of potassium iodide. He gives the drug in doses of two to five grains, five times a day, over a period of two and three years with periods of intermission. Rest is essential and the diet should be regulated. Romberg advises a mixed diet with a moderate amount of meat and considerable fluid. Doevenspeck³ has been using iodide of potassium intravenously. He advises this method of administration in cases of fulminating *syphilis*. In several cases of brain *syphilis* the benefits were very striking. Doevenspeck used 1 gm. (1½ gr.) of potassium iodide, giving it in the form of a 5 per cent. solution. No ill effects were produced and the pain at the point of injection was only transient.

Iodine. Kinnaman⁴ has made an experimental study on the antimicrobial power of iodine. He concludes that iodine in the strength of 0.2 per cent. to 1 per cent. is a most efficient germicidal agent. It furthermore has the advantage of being easily prepared and stable; is non-irritating and non-toxic in effective strengths; does not coagulate albumin or form inert compounds with the tissues; is effective in a short time, and lastly, and most important, has remarkable penetrative powers. The stain it produces wears off very soon. Carmaday,⁵ from practical experience with iodine, believes that it is the best possible disinfectant for the hands and the operative site. He uses it under these circumstances as the final application in the strength of 5 per cent. For skin *disinfection* Carmaday recommends the following formula: Tr. iodine 2.5 grams, potassium or sodium iodide 5.5 grams, water 250 c.c. This combination is stable and can be diluted to any desired strength. In the strength of 1 to 1000 Carmaday has found iodine valuable for irrigation in uterine sepsis, abscess cavities, empyema, etc. He uses the official tincture of iodine after the removal of necrotic tissue. In patients

¹ Therapeutic Gazette, December 15, 1905.

² Deut. med. Woch., 1906, No. 5.

³ Therapie der Gegenwart, 1906, No. 12.

⁴ Jour. Amer. Med. Assoc., September 2, 1905.

⁵ Ibid., April 14, 1906.

with lowered resistance, Carmadlay has found a 10 per cent. solution of *iodoform* in sterilized glycerin or olive oil most efficient in the treatment of cold abscesses.

Witzel¹ repeats his warning against the local use of iodine as a remedy for toothache. He has already reported one death from this cause. He cites the case of a woman who had been ordered to paint an inflamed gum with tincture of iodine. As the iodine gave relief she kept on repeating the applications, with the result that the membrane became necrotic and an alveolar abscess developed.

Lactic Acid. Chandler² reports a series of cases of *cervical gonorrhea* treated by lactic acid. His method is as follows: First cleanse the vagina and cervix thoroughly with warm water and cotton soaked in a water solution (4 ounces to 6 ounces) of pyroligneous acid. Expose the cervix by drawing it downward and into view by an ordinary long tenaculum. Then take an ordinary hypodermic syringe loaded with pure lactic acid and inject just beneath the membrane a few drops of the acid. Continue this until the whole of the cervix is exposed as the superior and inferior lip is injected. It may be done in one sitting, or in a nervous patient, if desired, in two or three sittings.

Chandler's experience with cervical gonorrhea and the lactic acid treatment lead him to conclude that this method will cure the discharge and prevent its spread to the body of the uterus; prompt action will spare the uterus, tubes, and ovaries. The injections have no ill effects, although too deep injections may produce a slough which, while not dangerous, is annoying and interferes with a good result.

Attention is directed to the necessity of making a microscopic examination of these chronic cervical discharges, as many of them are due to the gonococcus.

Lead. In last year's review of PROGRESSIVE MEDICINE, December, 1905, p. 345, mention was made of Miller's report of two cases of lead poisoning following the use of lead acetate pills in therapeutic doses. Since then two additional cases have been put on record by Arnell³ and Pepper.⁴ In both of the last mentioned cases the lead acetate had been prescribed for diarrhea, the total amount taken amounting to 2 to 2½ drams in five or six weeks. These cases indicate that caution should be observed in administering lead internally, especially for any length of time.

Berry⁵ is surprised that the local application of lead is not more frequently used in inflammatory conditions. He employs lead lotion (tepid) on lint covered with oil skin to lacerated fingers and other lacerated

¹ Deut. med. Woch., November 9 and 16, 1905.

² Jour. Amer. Med. Assoc., October 7, 1905.

³ Amer. Med., October 14, 1905.

⁴ Ibid., March 31, 1906.

⁵ Lancet, September 16, 1905.

or bruised wounds and to inflamed joints. When the inflammation shows a tendency to spread, he applies hot fomentations to the wounded surface and lead applications to the reddened surface. Berry claims that this procedure limits the spread of the inflammation.

Blackburn¹ has recorded a case of idiosyncrasy to lead-water and laudanum. A single application of this lotion to the leg produced untoward effects. Within twenty-four hours there was pronounced erythema with burning and itching at the site of the application. This was followed by the formation of vesicles and pustules and marked swelling of the forehead, eye-lids, and cheeks, which were also affected with burning and itching. The condition disappeared in ten days.

Three months later a similar application to an inflamed wrist-joint resulted in similar untoward effects.

Lithium. An editorial article in the *Journal of the American Medical Association*, May 5, 1906, on uric acid solution is of interest. The vendors of the innumerable alkaline waters all lay great stress on the presence of lithium carbonate and its power of dissolving uric acid. As the editorial points out, it is preposterous to think of dissolving uric acid concretions after they have once formed, particularly by means of the infinitesimally small dose given by mouth. It is, furthermore, pointed out that while lithium carbonate will readily dissolve uric acid in the test-tube, it is immediately converted in the stomach into lithium chloride, a salt that possesses only slight uric acid dissolving properties. It is more than probable that the virtues of these various alkaline waters rest in the water itself. It is a well-recognized fact that abundant water drinking, combined with a rational diet, acts favorably in most disorders of metabolism. The editorial closes by suggesting that if some form of water is thought necessary why not prescribe an ordinary pure water, to which may be added a teaspoonful of baking soda or a pinch or two of precipitated chalk. This is in line with the teaching of H. A. Hare for the past ten years. He has always advocated the use of a simple pure water in those cases where it is necessary to keep the kidneys flushed out. His reasons are that it is the water that does the good, and the patient is, in addition, saved the expense of paying a fancy price for one of the alkaline waters. If a moral effect is deemed necessary, a tablet of lithium carbonate can be dissolved in each glass taken.

Mercury. The manner in which mercury is taken into the system is by no means clear. In an experimental study Conti and Zuccola² determined that the white blood cells are the carriers of the mercury and deposit it in the various organs. They found that the liver, intestines and kidneys receive the largest amount and that the other organs, as the

¹ Jour. Amer. Med. Assoc., March 31, 1906.

² Riforma Medica, March 17, 1906.

pancreas, salivary glands, thyroid, etc., received comparatively small amounts, except in cases of acute poisoning, where the system becomes overcharged with the drug. When deposited in an organ the mercury selects by preference the nuclei of the cell. When given by inunction it has been generally believed that the drug is absorbed from the skin by the lymphatics. Rudnik,¹ however, is inclined to believe that the drug is taken directly into the circulation through the capillaries. This theory would help explain why the hemoglobin is increased after a few inunctions, and also the failure of the mercury to do good in anemia and in alcoholics in whom the capillary circulation is poor.

It is apparent from several articles that have appeared during the past year that the administration of mercury to patients with damaged kidneys may be attended with serious results. The experimental studies of Conti and Zuccola,² already alluded to, show that the kidneys are among the organs selected by the mercurial deposit and that the nuclei of the cells are particularly affected. This probably explains why mercury is not well borne by nephritics. Klieneberger³ has made a study of the effect of mercurial inunctions in thirty-seven cases. It is his opinion that this method of administration is not altogether harmless, and that changes in the urine develop almost constantly due, to the action of the mercury on the secreting parenchyma of the kidneys. He does not believe that mercury should be given for a long time and without sufficient grounds in chronic nephritis. If albumin and casts appear in the urine the mercury must be discontinued. Martin⁴ also cautions that the condition of the kidneys be ascertained before instituting antisyphilitic treatment, since all forms of nephritis render the proper administration of mercury difficult.

As an illustration of the serious effects the prolonged use of mercury may have on the kidneys, the following case, reported by Wilson,⁵ is of interest: A colored man who was satisfactorily convalescing from a severe pericarditis developed a severe stomatitis and later had severe inflammatory swelling followed by closure of the jaws. Some days later the man died from uremia. It was then discovered that the patient, through a misinterpretation of an order, had received 84 grains of calomel within fourteen days. From this experience Wilson believes that the routine use of mercury should be preceded by a careful urinary examination, as serious results may occur from even the mildest form of the drug. Furthermore, if a nephritis exists mercury should be used with extreme caution. Some years ago I saw the most intense stomatitis

¹ Wiener klin. Rundschau, November 5, 1905; editorial, Jour. Amer. Med. Assoc., December 23, 1905.

² Loc. cit.

³ Ztschr. f. klin. Med., 1906, Nos. 5 and 6.

⁴ Therapeutic Gazette, August 15, 1906.

⁵ Jour. Amer. Med. Assoc., May 19, 1906.

and exacerbation of symptoms produced in a case of acute nephritis from the use of three doses of calomel, each of one grain. The following cases are of interest in this connection, although they are cited as cases of poisoning from the use of intramuscular injections. While the previous condition of the kidneys is not mentioned, it is quite possible that the toxic symptoms were produced by the action of the mercury on kidneys already the seat of a nephritis. Le Noir and Camus¹ report a fatal case of mercurial poisoning which was believed to have been due to intramuscular injections of gray oil. The patient, a woman, had had a labial sore two months prior to her admission to the hospital. On admission she had an intense ulcerative and gangrenous stomatitis. She was put on antisyphilitic treatment and at intervals of seven or eight days "gray oil" was injected into the buttocks; the amount injected amounting altogether to about 30 centigrams (grains 5). Three days after the last injection salivation began, all the symptoms became aggravated and the patient shortly died. At autopsy the kidneys showed an intense grade of acute nephritis.

Sicard² also mentioned a case in which the injection of "gray oil" into the buttocks led to toxic symptoms, stomatitis, albuminuria and enteritis. In this case there was a lump at the site of the injections and the x-rays showed the presence of metallic mercury. Excision of the lump showed the presence of lardaceous material and metallic mercury. It is stated that Jonathan Hutchinson had had similar experiences and for this reason deprecated the use of injections and favored the administration of the mercury by mouth as in this way evidences of toxemia could more readily be controlled.

In regard to the danger of intramuscular injections of mercury, Gottheil, who has been administering the drug in this way for the past two or three years, states that he has never had any untoward effects.

The treatment of *syphilis* is a subject of great practical importance and one that has been given much attention during the past year. There is no question as to the drugs to be administered, namely, mercury and the iodides, but there is a great diversity of opinion as to the form of mercury to be employed and the method by which it shall be introduced into the body. The time at which the administration of mercury shall be instituted is almost universally stated to be after the appearance of the secondary stage when the diagnosis is established beyond doubt. Martin alone, among those writing on the subject recently, advocates beginning mercury before the appearance of the eruption, when the diagnosis of chancre is positive. Among those who have written on the treatment of syphilis are Fox, Hartzel, Hardaway, Martin and

¹ British Med. Jour., February 17, 1906.

² Ibid.

MacGowan,¹ Lerch,² Boulengier,³ Rudig,⁴ Williams,⁵ Gottheil,⁶ and Billings.⁷

While it has long been held that once a chancre has appeared methods directed toward aborting the disease were futile, it now seems possible, as Gottheil states, that the prevention of constitutional disease may be effected by excision of the initial lesion. He refers to a personal observation of this kind and to several others mentioned in the literature. Interesting and important experimental results on the abortion of syphilis have been published by Metchnikoff and Roux.⁸ From experiments on apes they found that if an ointment composed of calomel ten parts and lanolin twenty parts was applied with friction to an abraded surface inoculated with syphilitic virus infection with syphilis was prevented. A control animal on which the ointment was not used developed typical chancres on the twenty-eighth day, while the experimental animals were free from any evidence of syphilis sixty-eight days after inoculation. The calomel ointment was applied one hour after the inoculation.

Fox entitled his paper "The Over-treatment of Syphilis." He contends that syphilis, in common with other infectious diseases, is subject to the same variations in virulence, and, like the infectious diseases, is often self-limited, and will run its course without specific treatment if the general welfare of the patient is attended to. He also disapproves of a fixed rule of continuing the treatment in each and every case for a certain definite time. While there are few who would be willing to take chances of disregarding the use of mercury entirely, Fox is undoubtedly right in insisting on paying more attention to the hygiene of the patient's life. As Martin says, every effort should be made to bring the patient's vitality up to the highest point through attention to his diet, exercise, environments and hours of sleep. If this is insisted on less mercury will, as Fox insists, be needed and the patient in the end will be the better in every way.

When administered by the mouth the protiodide of mercury or mercury and chalk seem to be the preparations most favored.

The administration of mercury by inunction is advocated by Lerch, Boulengier, and Rudig. The former bases his preference for this form of administration on the ground that the mercury is taken up by the lymphatics, and hence a greater impression is made on the disease.

¹ Therapeutic Gazette, August 15, 1906.

² American Medicine, November 4, 1905.

³ Presse Médicale Belge, 1906, No. 13.

⁵ Clinical Journal; Jour. Amer. Med. Assoc., December 23, 1905.

⁶ PROGRESSIVE MEDICINE, September, 1906.

⁷ Jour. Amer. Med. Assoc., December 23, 1905.

⁸ Annales de l'institut Pasteur, 1906.

⁴ Ibid.

The objections to this method are the difficulty of getting patients to rub the mercury in sufficiently thoroughly and its uncleanness.

Williams favors this method when inunctions can be given by a professional rubber, otherwise he thinks the patient will slight the treatment.

The other writers referred to would restrict this method to those cases where a quick effect is necessary, because of obdurate forms of the disease, or in those cases where a rapid effacement of the cutaneous lesions is necessary, because of social reasons. Inunctions are almost universally employed in infants suffering from hereditary syphilis. Vapor baths and hypodermic injections of mercury are usually reserved for that class of cases in which the disease resists the ordinary methods of treatment. Martin speaks very highly of the vapor baths.

Gotthéil has for the past few years practised the hypodermic method to the exclusion of all others. He claims for it a better control of the patient, as he must always report for the injections. An excellent description of this method is given by Gotthéil in the September, 1906, number of *PROGRESSIVE MEDICINE*.

The use of the iodides is restricted to the latter part of the second year and to tertiary manifestations of the disease.

As to the length of time that the treatment should be continued it is almost universally taught that it should be continued well beyond the final disappearance of secondary manifestations. This will usually extend the time to from two to four years, although in the last year or two the periods of treatment are broken by long intermissions. Martin further recommends that for years afterward a course of treatment should be taken each spring and fall.

The following formulæ are recommended by Williams in the management of a case of syphilis. In the majority of ordinary diarrheas the following are useful.

R.—Hydrarg. tannatis gr. iss
 Pulv. opii gr. $\frac{1}{4}$ to $\frac{1}{2}$
 Ext. hematoxyli,
 Ext. gentianæ āā gr. ss

M.—Ft. pilula No. i.

Sig.—One such pill three times a day.

R.—Hydrarg. cum creta gr. j
 Bismuth carb. gr. ij
 Pulv. opii gr. $\frac{1}{4}$ to $\frac{1}{2}$
 Ext. hematoxyli gr. ss

M.—Ft. in pilula No. i.

Sig.—One such pill three times a day.

Williams states that mercurial diarrhea may also be controlled by the administration of two or three raw eggs a day.

The mouth and teeth should be carefully cleansed after taking food

and decayed teeth should be attended to at once. The gums may be hardened by painting them night and morning with 90 per cent. alcohol.

A very efficient mouth wash is the following:

R.—Plumbi acetatis	℥ iiss
Pulv. alumin	℥ v
Aque	f ℥ xvj
M.—Dissolve the salts separately, mix, filter and add essence of peppermint one-half dram.	
Sig.—As a mouth wash four times a day.	

Constipation may be overcome by adding extract of belladonna gr. $\frac{1}{10}$ and aloin gr. $\frac{1}{10}$ to each pill.

When the patient is anemic and run down the following combination containing iron is recommended:

R.—Hydrarg. cum creta	gr. j
Ferri reducti	gr. j
Quin. sulph.	gr. ss
Ext. nuc. vomic.,	
Pulv. opii.	āā gr. $\frac{1}{6}$
Ext. gentianæ	gr. ss
M.—Ft. in pilula No. i.	
Sig.—One such pill three times a day.	

Billings¹ especially recommends the *salicylate of mercury* in the treatment of parasyphilitic conditions.

Salicylate of mercury	gr. xxiv
Liquid paraffin	℥ ss

Sig.—Five minims injected subcutaneously two or three times a week.

Nash² reports the successful treatment of a case of *tuberculosis* by inunctions of mercury until the patient was salivated. It is not altogether clear in this case, however, that the case might not have been one of lung syphilis. Brown³ claims to have obtained good results in a case of tuberculous meningitis from the use of mercurial inunctions.

It is generally believed that mercury is not beneficial in tuberculous conditions. A note in the *Journal of the American Medical Association*, March 31, 1906, p. 985, states that mercurials in other chronic diseases than syphilis are cell poisons. In tuberculosis and other wasting non-syphilitic diseases the chief object in the adoption of any therapeutic measures is to feed the cells of the body and not to destroy them. It follows, therefore, that in these diseases mercurials, at least their continued or frequent administration, is contraindicated. "In cases of coexistent syphilis and tuberculosis, mercurials are not contraindicated. In cases of this kind the regular syphilitic treatment should be carried out."

¹ Jour. Amer. Med. Assoc., December 23, 1905.

² Lancet, December 23, 1905.

³ Ibid., March 24, 1906.

Mushroom Poisoning. In last year's PROGRESSIVE MEDICINE, December, 1905, p. 347, Berry's article on this subject was reviewed. His experience with *atropine*, when given in any but the terminal stages of the poisoning, was that it was a reliable antidote.

Plowright,¹ writing on the subject of mushroom poisoning, states that the *Amanita phalloides* or poison cup is responsible for most of the cases. This variety of mushroom owes its lethal power to a toxalbumin, phallin. In France alone eighteen deaths have occurred from eating this fungus since 1900. Six of the cases treated with atropine proved fatal, as did three others in which belladonna was used.

Inasmuch as the poisonous variety will peel almost as well as the common mushroom it is important to bear in mind that the phalloides is never anything but white beneath the cup, while the mushroom is pink, purplish brown, or nearly black; on top the phalloides is frequently nearly white, though there are traces of yellowish green especially about the margin. The stem of the phalloides is bulbous and has a cup-like base; the stem of the mushroom is nearly cylindrical. The phalloides grows in woods or at the margin of fields and never in meadows, as does the common mushroom.

After the ingestion of one of the non-edible varieties, symptoms of poisoning may appear within a few hours, or be delayed ten or twelve hours. The attack is ushered in by colicky pains in the abdomen, nausea, vomiting, purging, and cramps in the limbs, followed by signs of collapse, *i.e.*, pallor, sweating, a feeble pulse, and subnormal temperature. There may be also headache, dimness of vision, and delirium. In the terminal stages slight jaundice may be noted. Spagnolio and Signer² found a marked leukocytosis in three cases of mushroom poisoning which they studied.

At postmortem there are absence of rigidity, with inflammation of the gastrointestinal mucous membrane, areas of ecchymoses in the liver, gastrointestinal tract, lungs, and pleura. The liver shows fatty changes, the meninges are hyperemic, and the blood very thin.

Plowright recommends that the stomach and intestines should be emptied only in the early stages. Berry states that an emetic is rarely needed as the preliminary vomiting usually empties the stomach. For clearing out the intestines castor oil may be used. Owing to the collapse, active cardiac stimulants are needed and must be used heroically.

It is unfortunate that Berry's experience and belief in atropine is not shared by others as cases of mushroom poisoning are not infrequently met with, without any adequate means of relieving them.

Ford³ has succeeded in immunizing rabbits and guinea-pigs so that

¹ British Med. Jour., September 9, 1905.

² Riforma Medica, vol. xxi, No. 50.

³ Medical News, October 21, 1905.

they were able to withstand large doses of phallin. From these immune animals he obtained a serum, 1 c.c. of which neutralized ten times the fatal dose of the extract of the phalloides. Whether larger animals, as the horse, can be utilized and a serum suitable for therapeutic uses be obtained remains to be seen.

According to a note in the *Bulletin générale de thérapeutique*¹ pulverized wood charcoal or, preferably, animal charcoal is an efficient antidote for mushroom poisoning. It is said that several spoonfuls of the charcoal mixed with water will effectually control the most severe cases.

Nitre. One of the most frequent conditions we are consulted for is the common cold, or cold in the head. F. P. Atkinson² claims that excellent results can be obtained by giving 30 minims of sweet spirits of nitre and an equal amount of aromatic spirits of ammonia in an ounce of water, first every two hours and then every four hours. Three or four doses usually suffices to stop the discharge. If the discharge is thick when first seen a snuff composed of cocaine gr. 1, menthol gr. 2, and boric acid gr. 100 effects a rapid cure. If the trachea has become involved, as shown by a tickling sensation in the throat after a long breath, the following mixture is used:

R.—Liq. ammonii acetatis	f 3ij
Spts. ætheris nitrosi	m _x
Aquæ	f 3j

Sig.—This dose is administered every four hours.

A word as to the use of *cocaine*. This drug is dangerous because of its tendency to habit formation. When used as directed by Atkinson the patient should be kept in ignorance of what he is getting and under no circumstances should such a prescription be renewed. Indeed, the danger of using cocaine for such a simple affection far outweighs any possible advantages it has, as of all the drug habits that of cocaine is by far the most disastrous in its effects.

In most cases of acute colds there is a varying degree of congestion of the pharynx although the patient may not complain of soreness in the throat. The throats of these patients should always be examined. A saline purge, a gargle containing chlorate of potassium and rest in bed for a day or two form a very efficient means of treating this condition. It is not always possible, however, to get these patients to remain in bed.

Opium. A very practical article on the use of opium in cardiac conditions has been contributed by Musser.³ It is his belief that opium is a tonic in cardiac debility, and that this is frequently proved clinically when, after the administration of morphine, the flagging heart of shock,

¹ N. Y. Med. Jour., May 26, 1906.

² British Med. Jour., January 6, 1906.

³ Jour. Amer. Med. Assoc., January, 1906.

or of sudden failure in myocarditis, is markedly improved. Musser advocates the use of small doses of opium (the deodorized tincture or the extract) for months and months in cases of myocarditis. This use of the opium tends to prevent angina pectoris and lessens or defers the dreaded asystole. Furthermore, these small doses check waste, reduce the susceptibility to peripheral sensations which fret an irritable heart; replace exciting stimulants, as alcohol and strychnine; calm an irritable nervous system and lessen the necessity for food to the relief of digestion, metabolism, and elimination.

Other cardiac conditions in which Musser has found small doses of opium useful are a weak heart after exhausting disease or after prolonged mental or physical pain, and failing compensation, with beginning stasis, when the patient is easily fretted and irritated. He also has used opium with advantage in the gradual engorgement from myocardial dilatation, in chronic parenchymatous nephritis, in arteriosclerosis, and for the relief of the dyspnea of myocarditis. In that form or stage of myocarditis associated with restlessness, Cheyne-Stokes breathing, dyspnea, and rapid pulse, continuous small doses of opium are sometimes of benefit.

The tachycardia of *Graves' disease* is frequently relieved by opium, and in three instances Musser believes the opium contributed to the cure of the disease. I have seen the restless and broken sleep in cases of chronic valvular disease entirely relieved by the hypodermic injection of $\frac{1}{20}$ to $\frac{1}{24}$ gr. of morphine at bedtime. It may be necessary to repeat this dose in an hour.

Permanganate of Potassium. The following reports would seem to indicate very convincingly that in permanganate of potassium we have an efficient means of combating the poisonous effects of snake-bites. Crum¹ has employed the permanganate successfully in eight instances of poisoning all due to the copperhead. His method is as follows: The area around the fang wounds is frozen with ethyl chloride spray; two parallel incisions are then made through the fang wounds. The wounds are then soaked for a few minutes with a strong solution of permanganate, and a dressing is applied wet with the solution. The edge of the dressing is raised every half-hour and fresh solution poured over the surface. If seen within an hour the patient is usually all right in two or three days. A few doses of strychnine with or without whiskey and ammonia may be given internally.

Rodgers² also reports twelve cases of snake-bite treated by permanganate, ten of which recovered. Rodgers believes that permanganate of potassium is certainly the most efficient remedy there is for combating this

¹ Jour. Amer. Med. Assoc., May 12, 1906

² Indian Med. Gazette, October, 1905

condition. In regard to the time elapsing before applying the treatment Rodgers gives the following intervals in the successful cases: In four cases it was applied at once; in three, a half hour had elapsed; but in two, a ligature had been applied shortly after the infliction of the bite; in three others, three-quarters of an hour, one hour, and four hours elapsed. The situation of the bite has some influence as the soft vascular and exposed parts are followed most quickly by symptoms. In the same issue of the *Indian Medical Gazette*, Civil Surgeon Choudhuri cites an instance of viper bite in a dog which was treated with permanganate, the dog surviving. In this instance the surgeon to whom the dog was taken applied a ligature about the leg and then incised the wound area; permanganate of potash crystals were then rubbed into the part. It is very interesting to note that two other dogs bitten by the same viper were untreated and died two and a half hours after the infliction of the bites.

Vorner¹ has found permanganate of potassium an efficient hemostat. It is particularly useful in the excision of warts, condylomata, small tumors, etc. In addition to its hemostatic properties it has the additional advantages of being antiseptic and cheap. Vorner employs it in the form of a strong solution, a paste, or a powder.

Phenol. Several articles have appeared showing the value of phenol in surgical conditions. Stewart² states that acute suppurative processes may be shortened and extension prevented by free incision and the application of carbolic acid and alcohol. This method is particularly valuable in the treatment of tuberculous softenings, as it permits of the closure of the cavity without drainage and thus hastens healing. Stewart has obtained good results from the use of the liquefied crystals in hydrocele and other cystic processes, and in the inflammations of the bursa and tendon sheaths.

Chlumsky³ has obtained good results in similar conditions by a mixture of phenol and camphor. His formula is as follows: Carbolic acid 30 parts, camphor 60 parts, and alcohol to make 100. The camphor seems to neutralize the caustic action of the carbolic acid, so that the mixture feels like oil or chloroform when poured on the hand.

Chlumsky has poured as much as 30 to 50 grams ($7\frac{1}{2}$ to $12\frac{1}{2}$ drams) of this mixture in a deep abscess cavity without producing any untoward effects. Infected wounds are rinsed with the mixture, and tampons soaked with it are placed in the wound until suppuration diminishes, when the mixture is poured in. Painting the affected area in erysipelas has given good results. The applications are made two to five times daily.

C. Ehrlich⁴ has used Chlumsky's method with very favorable results.

¹ Münch. med. Woch., September 19, 1905.

² St. Paul Med. Jour., September, 1905. ³ Centralbl. f. Chir., 1905, No. 33.

⁴ Münch. med. Woch., liii, No. 11.

Gillette¹ has been using a phenol camphor mixture for the past fifteen years. His formula differs from that just given. It is made by taking three parts of gum camphor and adding to it one part of phenol crystals. Heat is used to liquefy the phenol. In a few hours the phenol and camphor will be blended into a fluid which is permanent and is not changed by time or differences in temperature. This mixture can be used without following the application with alcohol as it does not destroy tissue as phenol alone will do. Gillette uses this mixture as a surgical dressing. He has also found that tonsillitis can sometimes be aborted by swabbing the tonsils with the mixture in full strength.

A case of *acute phenol poisoning* in a child is reported by Cutter.² Recovery followed the use of a stomach tube and the introduction into the stomach of a saturated solution of magnesium sulphate. Cutter also administered atropine hypodermically and ascribes the principal part of the recovery to this drug. Under the heading "Alcohol" the experimental work of Clarke and Brown will be found. These observers came to the conclusion that good results following the introduction of alcohol into the stomach in cases of phenol poisoning was in all probability due to the use of the stomach tube. In Cutter's case a tube was used, and it is quite likely that this led to the favorable outcome rather than the use of the atropine.

Quinine. In last year's review mention was made of Galbraith's method of treating pneumonia with large doses of quinine. During the past winter a number of letters and clinical reports have been published in the *Journal of the American Medical Association*, reporting good results from this plan. Taken altogether, however, these combined reports do not include many more cases than are treated in the wards of any one of the large city hospitals in a single term of service during the winter months. It must have been the experience of most, having the advantage of such a service, to note the varying virulence of pneumonia from year to year and even from month to month. As so many drugs have of late years been lauded as specifics in pneumonia it is interesting to note that the plan of treating pneumonia by large doses of quinine is by no means new and that more than thirty years ago it was advocated by Jurgensen. Judging from past experience, quinine will for a time enjoy a certain popularity and then like other similar plans be discarded and after an interval again be resurrected as the long sought for specific. From a study of the articles advocating the use of quinine I see no reason to modify the criticism made last year *i.e.*, that good nursing is often all that is necessary; in other instances stimulants applied at the right moment will tide over a crisis; and finally that in

¹ Amer. Jour. of Surg., December, 1905.

² Jour. Amer. Med. Assoc., August 11, 1906

a certain proportion of cases the patient is doomed from the start and the most heroic measures prove unavailing. In other words, every case is a law unto itself and experience nowhere counts for so much as in the treatment of pneumonia. All things being equal, the man who has had the management of the most cases is the one who will be the most successful, for his experience will tell him when to use drugs and when to abstain from meddlesome therapeutics.

In the case of a disease so common as pneumonia and one on which so much attention is bestowed it is unlikely that any form of treatment, if it offered a reasonable hope of reducing the present mortality, would be denied a fair trial. Pneumonia must at present be classed with erysipelas and whooping-cough, for which innumerable drugs and methods of treatment are advised, none of which, however, affect the course of the disease when a large number of cases is considered.

Cholera is another disease against which quinine has been lauded as almost a specific. Fullerton¹ has made this claim for years and recently reiterated his claims and called attention to the results obtained by Dr. Ussher at Van, Asiatic Turkey, in a limited number of cases. Heiser² now reports five consecutive cases of cholera, treated by quinine, at Manila, with a mortality of 100 per cent. Fullerton has claimed that treated by quinine, cholera should have a mortality falling somewhere between 2 and 25 per cent. Heiser states that the experience of physicians in the Philippine Islands, who have treated many cases, often several hundred, is that, during the active stage of the disease, the vomiting is so continuous that it is impossible to administer quinine and that patients who pass successfully through the vomiting stage usually recover without further treatment.

From a study of the effect of quinine on the various forms of *malarial parasites*, C. F. Craig³ concludes that: (1) Quinine exercises an injurious effect upon the plasmodia of malaria during all stages of their human life-cycle, whether intracorpuseular or extracorpuseular, except when it is administered just prior to sporulation, at which time the sporulating body is not injured and sporulation occurs, but most of the spores are destroyed by the drug while they are free in the blood plasma. (2) The marked morphological changes, degenerative in character, produced by quinine in all species of malarial plasmodia, during all stages of their growth, prove that in order to secure the best therapeutic results the drug should be continually present in the blood, and this is only possible when it is administered in divided doses and at regular intervals of time.

In regard to the prophylactic use of quinine in malarious districts,

¹ Medical Record, February 17, 1906.

² Ibid., August 4, 1906.

³ American Medicine, May, 1906.

Meixner and Kudicke¹ have given the result of their inquiries among fifty-nine persons living in German East Africa. While the answers obtained were not altogether satisfactory, and the number considered is small, still it was shown that none of the recognized ways of taking quinine prophylactically gave absolute protection or prevented outbreaks of the malaria in cases in which it was latent. They conclude, however, that 15-grain doses taken every ninth or tenth day commonly suffice for protection, especially for a short residence in an infected neighborhood, and in places where malaria is seasonal in its outbreaks. This dose (15 grains) in all but a few cases, however, gives rise to unpleasant symptoms, and sensitive persons are rendered unfit for work for the greater part of the day; this sensitiveness tends to increase. Weak digestive organs hinder the absorption of the quinine.

The use of quinine in *malaria hematuria* is considered by H. C. Buck.² His experiences are emphatically against the use of quinine in this condition. In treating malarial hematuria Buck recommends active purgation and the use of arsenic. When the bowels have been unloaded and the hepatic torpor relieved, the urine clears up and convalescence sets in.

Salicylates. Shoemaker³ in discussing the treatment of *acute articular rheumatism* advises that the patient be placed in a well-ventilated room and put on a diet consisting of broths, stale or toasted bread and butter, weak tea or coffee, and an occasional egg. Foods that ferment readily in the stomach, especially the carbohydrates, should be avoided.

For internal administration he recommends *salicin* instead of salicylate of soda or salicylic acid. The salicin is given in 10-grain doses every hour or two hours during the height of the disease, after the bowel has been emptied by a cathartic. Shoemaker also favors the use of alkalis, especially potassium citrate or a solution of ammonium acetate in acute rheumatism. The anemia is best combated by the tincture of the chloride of iron. Basham's mixture serves the double purpose of furnishing iron and an alkali.

An antiseptic mouth wash is recommended, as in many cases of rheumatism the tonsils form the portal of entry. Coal-tar products are condemned. Excessive temperature may be combated by an ice-bag to the precordium or even a cold bath. If pain becomes excessive, morphine may have to be resorted to, but care must be taken to avoid the habit.

Shoemaker also favors the local application of oil of gaultheria in conjunction with the salicin during the height of the disease and when joint pain is severe.

¹ British Med. Jour., February 3, 1906.

² Therapeutic Gazette, April 15, 1906.

³ N. Y. Med. Jour., 1906.

R. Olei gaultheriae	f 5 ij
Linimenti saponis	q. s. ad f 5 ij
M. et ft. linimentum.	

Sig.—Apply to joint with gentle friction, then envelop the joint in cotton and over this a flannel bandage.

William Shannon¹ in discussing the medicinal treatment of *acute rheumatism in children* advises that calomel in fractional doses, to be followed by a saline cathartic, be first administered. This not only cleans out the digestive tract but acts as a cholagogue and diuretic and also obviates the cerebral effects of the salicylate. Shannon uses the salicylate of soda. The drug is best given on an empty stomach, although in some cases it is better borne after meals. A child from five to ten years of age can be given 5 to 10 grains every three hours until there is marked relief of the symptoms; this usually occurs in from twelve to thirty-six hours. This same dose is continued four or five days longer. In addition to the salicylate Shannon gives 2 or 3 grains of powdered rhubarb and 10 to 20 grains of *sodium bicarbonate* three times a day. The use of an alkali in conjunction with the salicylates is now generally approved. In previous reviews I have called attention to observations which go to show that the use of an alkali prevents kidney irritation and renders larger doses of the salicylates possible. Holt² advises giving twice as much sodium bicarbonate as salicylates for this purpose, and Passler³ has recently called attention to the same point. The general management of a case of rheumatism as laid down by Shannon does not differ essentially from that of Shoemaker.

Longmead⁴ has reported eight cases of *poisoning from salicylate of sodium occurring in children*; two of them were fatal. In order to avoid a possible idiosyncrasy he advises that the drug be used cautiously at the beginning of its administration. Two interesting points are brought out by a study of these cases: First, constipation was present in all the cases before the salicylate was started, which indicates that a free action of the bowels is necessary; secondly, the resemblance of salicylate poisoning to diabetic coma indicates that bicarbonate of sodium might be useful both as a prophylactic and remedial measure. Both of these points, free catharsis and the use of an alkali, were strongly insisted on in the articles above quoted. The poisoning symptoms followed no fixed dose; some of the cases followed small doses, others unusually large ones.

Longmead's conclusions are as follows: (1) Salicylate of sodium sometimes causes in children symptoms resembling the acid poisoning of diabetes. (2) The toxic dose is variable, depending on the idiosyn-

¹ Medical Record, February 17, 1906, 281.

² Ibid.

³ Therapie der Gegenwart, vol. xlvii, Nos. 1 and 2.

⁴ Lancet, June 30, 1906.

crazy of the patient and the pressure or absence of constipation. (3) Acetone may be detected in the urine and in the breath, its presence constituting one of the first symptoms of poisoning, and affording a valuable danger signal. (4) Treatment should be directed to keeping the acidity of the urine low and the bowels opened in patients taking this drug. (5) If acetone is found or the urine gets more and more strongly acid the salicylate should be omitted and alkali given alone.

Lortat-Takob and Vitry¹ have shown experimentally that the intravenous injection of small doses of sodium salicylate increased the resistance of rabbits to streptococci.

Sparteine. As Pettet² says, this drug is little used. He attributes this to the fact that the dose usually recommended is entirely inadequate. In Pettet's opinion the proper dose is from $1\frac{1}{2}$ to 2 grains, the latter when given by stomach being as little as can be depended upon. While 1 to $1\frac{1}{2}$ grains are effective hypodermically he sees no reason why 2 grains cannot be administered in this way. The dose usually recommended varies from $\frac{1}{6}$ to $\frac{1}{3}$ of a grain, while the hypodermic tablets on the market contain from $\frac{1}{30}$ to $\frac{1}{10}$ of a grain, entirely too little, in his opinion, to be of any benefit.

Sparteine, in Pettet's opinion, has some of the advantages of digitalis and veratrum without any of their disadvantages. It slows the heart and increases its power, as does digitalis, but does not contract the anterior system; in this latter particular it acts as does veratrum, although not to so marked a degree. This is open to criticism. The best authorities teach that sparteine quickens the pulse and raises arterial pressure. In poisonous doses it is a circulatory depressant. Pettet recommends sparteine in cardiac irregularity, in *pneumonia*, and as a non-irritating diuretic. He recommends as an initial dose 2 grains; this is repeated in two or three hours, and then it can be administered every six hours. Jacobi³ recommends sparteine sulphate, in the dose of 2 to 5 grains daily, as an excellent cardiac tonic in *tuberculosis*.

Tansy. The oil of tansy has for many years enjoyed considerable reputation among the laity as an emmenagogue, and is frequently taken by women to avoid pregnancy. Recently several cases have been reported in which alarming symptoms of poisoning have arisen from this use of tansy. Whitehill⁴ has met with two such cases. Both cases presented the same symptoms, namely, epileptiform convulsions with extreme rigidity of the muscles, the jaws being firmly set, shallow respirations, a full, strong pulse, and widely dilated pupils which did not react.

¹ Le Progres Médical, March 31, 1906.

² Georgia Practicien, November, 1905.

³ American Medicine, December 23, 1905.

⁴ Jour. Amer. Med. Assoc., August 18, 1906.

The face was flushed and seemed swollen. Large quantities of mucus collected in the bronchi and throat. In one case as many as eight or nine convulsions were noted, lasting from three to four minutes each. The treatment consisted in the use of chloroform to control the convulsions and apomorphine to produce vomiting; this also caused relaxation of the contracted muscles. The stomach tube was used freely after the initial vomiting caused by the apomorphine, and later salines. In one case two or three doses of half a teaspoonful each were taken during the evening. It is to be noted that the pregnancy was not terminated by the use of the oil of tansy.

Tuberculin. The use of tuberculin as a curative agent in *tuberculosis* is becoming more and more widespread, particularly in Europe. During the past year several very valuable and instructive papers have appeared giving the results following its use over a long period of time. That of Trudeau¹ is worthy of extended notice, as it embraces a continuous experience with tuberculin from its introduction in 1890 until the present time. This paper is also a model of conservatism when one considers Dr. Trudeau's firm belief in the value of this product as a curative agent. A detailed account of this paper will give the readers of *PROGRESSIVE MEDICINE* the best obtainable information on the subject.

Trudeau refers to the enthusiasm which followed Koch's announcement of tuberculin in 1890, and the bitter reaction which followed its use. He says that from 1891 until 1900 it was with the utmost difficulty that he was able to persuade a few patients each year to submit to the treatment.

In reference to the use of tuberculin as a diagnostic agent, it has been used off and on for the past fifteen years at the Adirondack Cottage Sanitarium. With the exception of three cases Trudeau has never seen the slightest ill effects follow this use of tuberculin. In one of these cases there was an aggravation of all the symptoms, and the patient eventually did badly; in the other two, the reaction was followed by blood-spitting. Whether these were mere coincidences or not he is unable to state. Farther on, in speaking of the curative use of tuberculin, he states that he has had tuberculous meningitis, hemoptysis, and uncontrollable pyrexia, all ending fatally, occur in patients who were about to take tuberculin, but for some reason or other did not take it. He believes that while the tuberculin reaction is of great value in doubtful cases it should never be resorted to until the ordinary methods of diagnosis have been fully tried. Increasing knowledge of the symptoms and signs of early pulmonary tuberculosis will render a resort to the tuberculin test less of a necessity.

A word as to the method of applying the tuberculin for diagnostic

¹ Amer. Jour. Med. Sci., August, 1906.

purposes. Absence of temperature is necessary. In order to ascertain this point the temperature should be taken every four hours, for at least two or three days, before the proposed injection. A rise in temperature to 99.5° F. does not necessarily prevent the application of the test. The initial dose for diagnostic purposes is 1 mg.; if no reaction occurs with this amount, 3 mg. are given after an interval of two or three days; a third test may be necessary, when 5, 7 or 10 mg. may be given. If no reaction occurs after the third test the patient is considered as being non-tuberculous. The test injections are given in the evening, and from then on the temperature is taken every two hours. The reaction (rise in temperature, malaise, and general pain, especially in joints) occurs as a rule within twenty-four hours. Delayed reactions (thirty-six to forty-eight hours) sometimes occur.

Turning again to the curative properties of tuberculin, Trudeau states that in spite of the popular clamor against its use he persisted, because of a certain degree of success demonstrable in animals by the experimental method, and also because the production of artificial immunity by the specific poison of a disease is the line along which success has always been attained, and is being attained in other infectious diseases. In regard to this point he refers both to the work of others and to his own. Thus as early as 1892 he showed that by treating tuberculous iritis in the rabbit's eye by subcutaneous injections of the unheated filtrate of bouillon cultures of the tubercle bacillus a retrogression of the lesion and apparent healing gradually took place, which, however, ultimately relapsed somewhat, though very slowly. Trudeau has also found that guinea-pigs and rabbits previously injected with dead tubercle bacilli live, on the average, somewhat longer than the control animals when subsequently inoculated. While the dead products of the tubercle bacillus are capable of producing a slight immunity, it is not to be compared with preventive inoculations with living attenuated cultures, as practised on animals, by both Behring and himself. "Nevertheless, tuberculin immunization, even in the most susceptible animals, undoubtedly prolongs life somewhat, retards the development of the disease in its earlier stages and produces changes in the lesions, which demonstrate an attempt at healing, which, in localized tuberculosis, may be equivalent to a more or less complete cure."

Trudeau has used all of the tuberculins, but has had the most experience with Koch's three tuberculins (Koch's original tuberculin, Koch's T. R., and his bacillen emulsion); since 1901 the bacillen emulsion has been principally used.

The well-known reaction of tuberculin is practically identical with any of the preparations. The relative therapeutic value of the various preparations could not be determined, although the T. R. and the bacillen

emulsion seemed more uncertain in their action and capable of more frequently producing strong and unexpected reactions. For this reason their use must be attended by great caution. The probable reason for these unexpected reactions lies in the fact that these tuberculins are mostly emulsions and not solutions, and unless thoroughly shaken and the fluid drawn from the centre, instead of from the top or bottom, varying amounts of the suspended bacterial substance will be obtained.

The cases selected belonged (with a few exceptions) in the incipient and advanced class who were mostly apyretic, or whose temperature at irregular intervals only reached from 99.5° to 100° F., and whose general nutrition was good. The acute types of the disease were excluded, *i. e.*, those with marked febrile remissions or hectic fever; those with continuous temperatures, even if not above 100° F., with little to be heard in the lungs, but with rapid pulse, emaciation, debility, and cachexia, pointing to scattered miliary tuberculosis. Other observers, however, have advocated tuberculin injections even in these acute febrile cases.

At first only the most favorable cases possible were chosen; later, however, less favorable ones were submitted to the treatment, particularly those whose improvement seemed to be at a standstill, and there seemed but little chance of arresting the disease under the usual Sanitarium methods. Trudeau very frankly admits that the desire to choose from among the patients only the most favorable must have somewhat influenced the result.

The following fact in regard to tuberculin is most important, as it is largely through ignorance of the potency of tuberculin that it fell into disfavor. It must be borne in mind that so infinitesimal a dose as $\frac{1}{50000}$ of a milligram of the solid substance contained in Koch's bacillen emulsion may produce typical and marked constitutional disturbance in the tuberculous individual. For this reason it is not to be used heedlessly, as harm will certainly result if carelessly administered. Trudeau is most emphatic in his warning, and cautions all who would make use of tuberculin to proceed with every care possible.

Method of Administering the Tuberculin. When tuberculin was first introduced it was believed that strong febrile reactions were necessary. From his own experience, Trudeau states that he has come to look upon fever reactions as unnecessary, and that while an occasional reaction may unavoidably occur, every care should be exercised to avoid them. When the reactions are frequent and violent it is an indication that the tuberculin is having a bad effect on the patient and should be discontinued. Trudeau views these violent reactions as an indication of overstimulation. He is of the opinion that the curative influence of the tuberculin is due not only to a local reaction of the lesion but also to a stimulation of the body cells by the injected toxins, *i. e.*, a stimulation

which results in the production of some sort of antibodies by these cells as well as, possibly, an increased activity of the phagocytes. For these reasons, minute doses, very gradually increased, and continued over a long period of time, would be the best method of treatment. That these very minute doses are capable of exerting an action is indicated by the local reaction and leukocytosis which occurs in rabbits with tuberculous iritis. Furthermore, the opsonic work of Wright and Douglas shows that minute doses and a very gradual increase will give a response.

Trudeau recommends that the treatment be started with a very minute dose, $\frac{1}{10000}$ or even $\frac{1}{20000}$ mg. of solid substance, Koch's bacillen emulsion, or $\frac{1}{1000}$ mg. of old tuberculin. He recommends the increase in dose, and interval between doses, be so adjusted that full doses are reached with as little disturbance as possible. By taking sufficient time, he believes that most patients can be taken through the entire treatment with but occasional and moderate reactions. The slightest evidence of intolerance, as manifested by temperature, aggravation of symptoms, irritation at site of lesion, or depreciation of the general condition, indicates that the dose should be lowered for a time and the intervals between injections lengthened. If a reaction occurs care should be taken not to inject until all the effects of the reaction have passed away.

While taking the injections there should be no depreciation of the general health, and no fever above the usual temperature range, except it be for the forty-eight hours following an increase in dose. If depression of health occurs, the treatment should be discontinued, and only resumed when the normal is again reached. If full doses, that is 1 c.c. of old tuberculin or 5 milligrams solid substance, bacillen emulsion, can be reached without violent reactions and without depreciation of the general health, the injections should continue until one full dose has been given. The intervals should be lengthened gradually, as the higher doses are reached and extended to two weeks between the last two or three injections. Six months of treatment is almost always necessary, and a year or more would be better in many cases.

Trudeau quotes Denys in giving the principal faults leading to failure, and even seriously endangering the patient's chances of recovery. These are: (1) Beginning the treatment with too large amounts; (2) raising the dose too rapidly or at too short intervals; (3) injecting again before all effects of a reaction, both constitutional and local, have passed away; (4) increasing the dose after a reaction has occurred; (5) neglecting to consider malaria, headache, loss of appetite, and increased cough as evidences that the limit of the patient's tolerance has been reached, and calls for an interval of rest and a reduction of the dose.

It speaks well for the future of the tuberculin treatment, when one with so wide an experience as Trudeau says that he is convinced that any

danger there may be of aggravating the patients' condition by tuberculin treatment lies principally, if not wholly, in its faulty or reckless administration.

Results. The immediate results are not striking, and Trudeau says that up to the time of discharge there is little difference to be noted between the treated and the untreated; still, he has formed the impression that the tuberculin gives somewhat better results than by the Sanitarium methods alone, even at the time of discharge.

The physical signs may appear to grow worse and rales be heard where before they were absent, and expectoration may increase; but if strong reactions are avoided, this is not marked, and everything returns to the previous condition if the doses are not pushed too rapidly.

The influence of tuberculin injections on the disappearance of bacilli from the expectoration when the entire number treated and untreated at the Sanitarium is considered was as follows: of those who had bacilli in the incipient class 64 per cent. of the untreated and 67 per cent of the treated lost them; of those classified as advanced on admission, 44 per cent. of the treated lost them and 24 per cent of the untreated.

Comparison of 185 cases treated and 864 untreated, from which number were excluded all who stayed less than ninety days and all who did not have tubercle bacilli on admission. The results at time of discharge were as follows:

	Incipient.			Advanced.		
	Apparently cured. Per cent.	Disease arrested. Per cent.	Active. Per cent.	Apparently cured. Per cent.	Disease arrested. Per cent.	Active. Per cent.
Treated . . .	56	34	10	27	55	18
Untreated . .	50	38	11	6	51	43

A consideration of this table and of the figures relating to the tubercle bacilli shows that the advanced cases both so far as loss of bacilli and the condition on discharge was concerned, seemed to derive more benefit, proportionately, than did the incipient cases treated. In regard to this point, Trudeau cautions against laying too much stress, owing to the uncertainties relating to sputum examinations, unless several examinations are made at considerable intervals, and the personal equation of the physician be excluded, as influencing the classification of a patient at discharge.

In the following table dealing with post-discharge mortality, the results are more convincing, for, as Trudeau says, there can be no doubt as to whether the patient is living or dead.

This table is formed on the basis (1) of equal numbers of treated and untreated cases in each year; (2) excluding all cases who stayed less than three months; (3) excluding all cases who left the Sanitarium less than one year ago; (4) excluding all untraced cases.

	Incipient.		Advanced.	
	Living. Per cent.	Dead. Per cent.	Living. Per cent.	Dead. Per cent.
Tuberculin treated	79	21	61	39
Untreated	63	37	36	64

Trudeau closes his paper as follows: "Having stated the facts, I must therefore leave the interpretation of the figures to the individual judgment of those who may be interested in them. Many years ago, in spite of the general denunciation of tuberculin, and long before I knew anything about statistical evidence, I had formed the opinion that tuberculin, when carefully administered, had within certain limits a favorable influence on the course of the disease, and that the results of Sanitarium treatment could be improved and made more permanent in many cases by its application. As years have passed, I have seen no reason to change this opinion, which the figures I have quoted, however they may be interpreted, do not at any rate tend to contradict."

Next to Trudeau, Pottenger has probably had a more extensive experience with tuberculin than anyone else in this country. Within the past year Pottenger has contributed three studies on the clinical application of tuberculin, namely: "The Permanency of Results in Pulmonary Tuberculosis," "The After-history of Twenty-seven Cases Treated by the Combined Hygienic, Dietetic, Open-air and Tuberculin Treatment" (*Therapeutic Gazette*, October 15, 1905), "The Underlying Principles of Tuberculin Therapy" (*Medical Record*, June 2, 1906), and "A Report of Fifteen Cases of Laryngeal Tuberculosis Treated by Tuberculin" (Second Annual Meeting of the National Association for the Study of Prevention of Tuberculosis). Pottenger, with Trudeau, believes that tuberculin administered in proper doses and at proper intervals acts as a stimulant to the diseased area and hastens the formation of fibroid tissue. In addition, he points out that it has been demonstrated that the administration of tuberculin increases the opsonic index (the opsonic power or index being that property of the blood serum which prepares the bacilli to be destroyed by the leukocytes) and increases the agglutinating power of the blood. The value of increasing the agglutinating power of the blood is important, as it has been shown by Bullock and Spengler that a low agglutinating power entails a greater risk of relapse than when the agglutinating power is high.

Tuberculous laryngitis is very justly looked upon as a most serious complication. According to Pottenger, no remedy offers as much hope in laryngeal tuberculosis as does tuberculin. In this condition the effect of the remedy can be directly observed, and while the lesser infiltrations yielded to treatment more readily than the ulcerations, still with patience and perseverance even these cases could be made to yield a good percentage of cures. Of fifteen cases reported by Pottenger the

lesions healed, so that there was no further reaction to tuberculin in eleven instances.

In considering the after-history of twenty-seven cases of pulmonary tuberculosis treated by the combined method between the years 1899 and 1903, Pottenger reports the following results: of those classed as Stage I, twelve (100 per cent.) were apparently cured or had their disease arrested and remain cured to-day; of those classed as Stage II, six (75 per cent.) were apparently cured or had their disease arrested and remain cured to-day; while of the Stage III cases, two (28.57 per cent.) had their disease arrested and remain well to-day. By combining these figures, which is not altogether fair, 20 patients (74 per cent.) remain apparently cured. In other words, of 27 cases 20 are to-day living and well and engaged in the active duties of life. In not one instance has a relapse occurred, although six years have elapsed since the discharge of the first case and twenty-six months since the discharge of the last one. It is further significant that these cases were treated in office practice.

Pottenger states that in a former communication he gave the data of 1200 first-stage cases of tuberculosis. Of these 611 were treated in sanatoria with the ordinary open-air treatment, with a result of 391 (64 per cent.) of apparent cures; 579, most of them treated outside sanatoria, were treated with tuberculin, with a result of 496 or 84.2 per cent. apparent cures. Thus there was a percentage of 20.2 in favor of the tuberculin treated cases. While the data is still insufficient, it has been the experience of Trudeau, Turban, and Pottenger that tuberculin increases the permanency of the results.

Additional articles on the treatment of tuberculosis by tuberculin have been published by Bueloch,¹ Elsoesser,² Krause,³ and Griffin.⁴ That tuberculin is also coming into use in the treatment of the various surgical manifestations of tuberculosis is evident from articles by Kraemer,⁵ on the postoperative use of tuberculin to aid in the curative process, and Cheyne,⁶ H. M. Gray,⁷ and Pardal,⁸ in bone and joint tuberculosis and in genitourinary tuberculosis.

Ganghofner⁹ reports favorable results from the use of tuberculin in tuberculous children. Spengler¹⁰ is now using a bovine tuberculin. He states that its use is followed by a marked increase in the agglutinating power of the blood. Inasmuch as the tuberculin treatment will princi-

¹ Lancet, December 5, 1905. ² Deut. med. Woch., 1905, vol. xxxi, No. 48.

³ Münch. med. Woch., lii, No. 52.

⁴ Boston Med. and Surg. Jour., July 5, 1906.

⁵ Deut. Ztschr. f. Chir., vol. lxxix, No. 4-6.

⁶ Lancet, January 13, 1906.

⁷ Ibid., April 21, 1906.

⁸ Ibid., December 16, 1905.

⁹ Jahrbuch. f. Kinderheilkunde, 1906, No. 5.

¹⁰ Deut. med. Woch., August 17, 1905.

pally be used by those dealing largely with tuberculous diseases Spengler's advice had better be followed. He advises that before anyone undertakes to carry out the tuberculin treatment a course had better be taken at some institution where the principles of its application are known and can be fully demonstrated. Furthermore, it is very evident from Trudeau's paper that it is not for anyone and everyone to attempt to follow out this method without a very clear idea of what it is to be done.

Urotropin. This drug has now a well-established place in the treatment of *cystitis*. In regard to its use in *typhoid fever*, Easton¹ says that the moderate use of urotropin will prevent the occurrence of cystitis, and that, furthermore, the routine administration of urotropin in all cases of typhoid fever renders the urine innocuous to those brought into contact with the patient. Typhoid patients can be discharged with the assurance, so far as the urine is concerned, that they will be harmless to the community.

H. A. Kelly² recommends urotropin as a prophylactic in cases where cystitis is to be feared, and also in recent cases of cystitis when there is a tendency to alkaline changes in the urine. Kelly administers urotropin in doses of 5 to 10 grains three times a day.

Venesection. As a means of depletion, bloodletting is the most direct and rapid means we possess. It is not sufficiently recognized that venesection is the most efficient means we have of relieving a dilated right heart in failing compensation. Shattuck³ in an article on depletion in *heart disease* gives to this method the first place. He states that there are cases of heart disease in which bloodletting, and that alone, can turn the scale. I can testify to his statement that no one who has seen it can forget the effect—the gain in color and in breathing power with prompt increase in the urine and corresponding decrease in the dropsy—which may follow the abstraction of half a pint or a quart of blood. The more urgent the symptoms the more remarkable are the results obtained by venesection in cardiac disease.

Next to bloodletting Shattuck prefers purging. Outside of a hospital he believes this is the preferable method, if there is time. There is no danger of purging too much in these cases; indeed, one is apt to purge too little rather than too much. Sweating, tapping the serous cavities, and the use of diuretics are other methods of relieving cardiac dropsy.

Veronal. Since its introduction several years ago this drug has come into use more and more, especially in the treatment of *insomnia* due to neurasthenia, hysteria, etc. The drug is given in powder form in the dose of 5 to 7½ grains. It is claimed for it that it produces a more natural

¹ Boston Med. and Surg. Jour., August 17, 1905.

² Dominion Med. Monthly; Jour. Amer. Med. Assoc., February 24, 1906.
Boston Med. and Surg. Jour., May 17, 1906.

sleep than any other hypnotic, and that it is without disagreeable after-effects. It is also stated that patients do not develop a tolerance for veronal. So far the only ill effects from veronal have occurred from the taking of enormous doses with suicidal intent, or by mistake, and in evidences of chronic poisoning from continued large doses.

Cases of acute poisoning following large doses of veronal have been reported by Geiringer¹ (68 grains), Held² (135 grains), and German³ reports an instance in which death followed the ingestion of 250 grains. Treatment consists in emptying the stomach and the administration of caffeine, and of black coffee as in morphine poisoning.

Instances of chronic poisoning have been recorded by Kress,⁴ Hoppe, and Hoeftmann.⁵ In these chronic cases 30 to 45 grains had been taken daily for weeks. The condition is characterized by deep sleep, which in Hoeftmann's cases resembled drunkenness, especially in regard to speech. This cumulative action has been observed by Kress to follow several doses of $7\frac{1}{2}$ grains.

¹ Jour. Amer. Med. Assoc., February 17, 1906.

² Jour. de Pharmacie et Chir., February 16, 1905.

³ Jour. Amer. Med. Assoc., June 30, 1906.

⁴ Therapeut. Monats., September, 1905.

⁵ Jour. Amer. Med. Assoc., February 17, 1906, p. 550.

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